THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXVI. No. 659.] LONDON, DECEMBER 28, 1875. [27TH YEAR.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis—10,000 cubic feet of gas per ton of coal: 26-candle gas; 13¼ cwt. coke per ton of coal.
The London Exhibition in 1851 was lighted with gas made from Ramsay's Cannel.
RAMSAY'S PATENT CONDENSED COKE.
DO. GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.
GAS-RETORTS, introduced 1828. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.
Manufactories—Derwenthaugh, Swalwell, and Hebburn Quay, near Newcastle-on-Tyne; and London Wharves—Falcon Wharf, No. 80, Bankside; and Honduras Wharf, Cubit Town. Large stocks kept.
Address G. H. RAMSAY, NEWCASTLE-ON-TYNE.

GENUINE TORBAY PAINT
AND
SPECIAL GASOMETER PAINT
(Mixed ready for use).
These Paints are now used in 100 Country Gas-Works, and by all (but one) of the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. They will cover tar effectually. Also used by the Admiralty, War Office, Railway Companies, Founders, &c.
They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
STEVENS & CO.,
(SUCCESSORS TO SAMUEL CALLET. ESTABLISHED 20 YEARS.)
21, GT. WINCHESTER ST., LONDON.
WORKS: BRIXHAM, TORBAY.

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SPECIALITIES IN WOOD GRIDS
FOR
PURIFIERS & SCRUBBERS
MADE FROM THE BEST QUALITY
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WELL-SEASONED PLANKS.
SCRUBBERS FITTED WITH MR. LIVESEY'S BOARDS AT MODERATE COST.
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COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and OTHER OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
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JOS. COWEN & Co. are the only Manufacturers of FIRE-BRICKS and CLAY RETORTS at BLAYDON BURN.

JOHN RUSSELL AND CO.,
THE WEDNESBURY TUBE-WORKS, WEDNESBURY;
AND
THE ALMA WORKS, WALSALL.
Established at the commencement of Gas Lighting.
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35, 36, 37, & 39, GRANBY ROW, MANCHESTER.
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J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water; Gun-Metal Cocks, Stocks, and Dies; Galvanized Tubes and High-Pressure Tubes, &c.
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WET AND DRY GAS-METERS,
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Also, STATION-METERS, PRESSURE-GAUGES, STREET-LAMPS, REGULATORS, &c.
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TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
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Roofs, Girders, and Bridges, and General Smith's Work.
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RETORT-SETTING A SPÉCIALITÉ.
RETORTS SET, AND GUARANTEED TO BURN OFF A CERTAIN AMOUNT OF COAL, OR ELSE NO MONEY TAKEN FOR THE CONTRACT.
PLANS ON APPLICATION.
Retort-Setters sent to all parts of Europe and America.
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MANUFACTURERS OF

IMPROVED DRY GAS-METERS,

WARRANTED TO MEASURE CORRECTLY, AND NOT TO VARY.

EXTENSION OF PREMISES.

G. G. & Co. having had their premises entirely rebuilt, are now fairly in possession of large and commodious workshops, specially adapted to the requirements of the trade, and they are prepared to execute orders, large or small, with promptness and despatch.

THEY KEEP IN STOCK METERS OF ALL SIZES, UP TO 300 LIGHTS.

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236, GEORGE STREET, GLASGOW; and 30, LANCASTER AVENUE, MANCHESTER
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G. G. & Co. have just been awarded a SILVER MEDAL for Gas-Meters and Gas Apparatus at the Exhibition of the "Society for the Promotion of Scientific Industry," Manchester.

SILVER MEDAL, PARIS EXHIBITION, 1867.

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MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS

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LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES.

Boiler-Tube Ferrules, Gun-Metal Gland Cocks, Water-Gauges, Whistles, &c.; Stocks, Taps, and Dies for Screwing, and Gas-Fitters Tools.

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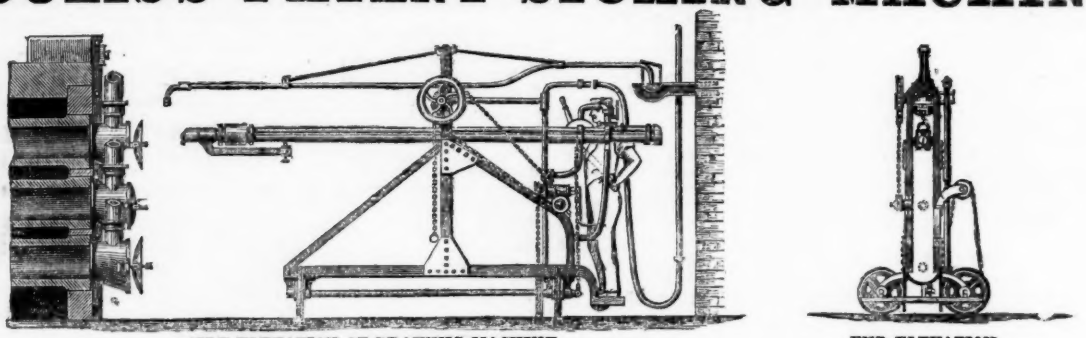
FOULIS'S PATENT STOKING MACHINE.



SIDE ELEVATION OF DRAWING MACHINE. END ELEVATION.

(The Charging Machine will be Illustrated in next week's Advertisement.)

Makers: TANGYE BROTHERS and HOLMAN, London and Birmingham; ADAM WOODWARD and SON, Manchester ROBERT LAIDLAW and SON, Glasgow; MASCHINENBAU-ACTIEN-GESELLSCHAFT HUMBOLDT, Kalk bei Deutz; Or all particulars may be had from JAMES WOTHERSPOON, 31, St. Vincent Place, Glasgow.

Established

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JOSEPH CLIFF & SON,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

MANUFACTURERS OF ALL DESCRIPTIONS OF

FIRE GOODS, and Salt-Glazed Drain-Pipes.

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Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;

LIVERPOOL—1, Back Leeds Street,

Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

TRADE MARK

THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

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WAREHOUSE: SOUTHWARK STREET, LONDON.

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PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.;

GAS-FITTERS TOOLS, VALVES, COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

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PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

London Agent: W. G. DAVIS, 2, BRABANT COURT, PHILPOT LANE, E.C.

THE

LANCASHIRE GAS-METER COMPANY,

LIMITED,

FALCON STREET, OLDHAM,

MANUFACTURERS OF

GAS-METERS, GOVERNORS, EXPERIMENTAL GASHOLDERS, &c.

HENRY THOMAS, Managing Director.

JOHN WRIGHT AND CO., ESSEX WORKS, BIRMINGHAM,

Beg to call the attention of MANAGERS and DIRECTORS of GAS COMPANIES to the following letter which they have lately received.

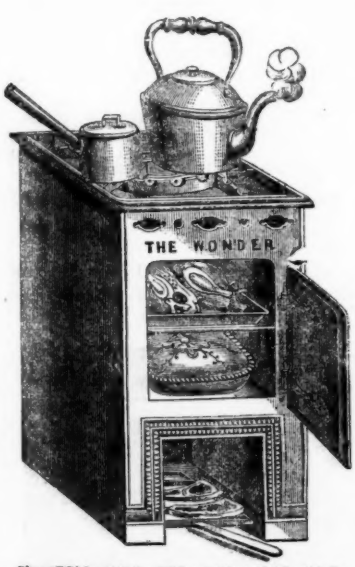
COPY OF LETTER RECEIVED FROM MAGNUS OHREN, Esq.

Crystal Palace District Gas Company, Lower Sydenham, S.E.

To Messrs. John Wright and Co., Essex Works, Birmingham.

Dear Sirs,—In reply to your inquiries, I am glad to state that the use of GAS COOKING AND HEATING STOVES has been a complete success here. We have several hundred in use in our districts. We also find it advantageous to let out Stoves at a small rental. We have now 275 Stoves at rent.

The Stoves you make I can with confidence recommend, having so many in use, and giving satisfaction. I need scarcely point out to you the advantage to Gas Companies to recommend the use of Gas Stoves to their Gas Consumers, even where they do not supply them on sale or rent, as the use of Gas Stoves brings day consumption, and thus the Company make a profit by day as well as by night.—I am, dear sirs, yours faithfully, MAGNUS OHREN.



Size, 25½ in. high; 14 in. wide; 12½ in. back to front.

Price 50s., complete with Pan and Gridiron.

GAS HEATING STOVES

(TERRA COTTA AND IRON).

THE CHEERFUL STOVE.

COOKING STOVES.

BREAKFAST COOKERS.

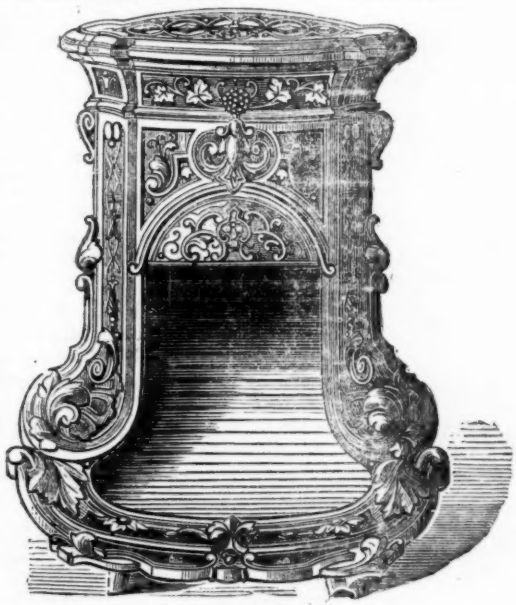
BATHS HEATED by GAS

GAS STOVES

For Boiling, Broiling, Preserving, Heating Flat Irons, and for all other Domestic Purposes.

Gas Companies and the Trade who have not our Illustrated Catalogue are respectfully requested to apply for same.

A LIBERAL DISCOUNT to the TRADE.



No. 4003.

THE CHEERFUL GAS STOVE, with Copper Reflector,

Has all the appearance of a Bright Fire.

PRICE from 32s.

THE

IMPERIAL METER COMPANY,

LIMITED,

KING'S ROAD, LONDON, N.W.,

OFFICE: 115, VICTORIA STREET, WESTMINSTER, S.W.,

MANUFACTURERS OF

"WET" & "DRY" GAS-METERS IN IRON & TIN-PLATE CASES,

STATION-METERS AND GOVERNORS, STREET-LAMP METERS, BOXES, AND REGULATORS FOR THE AVERAGE METER SYSTEM.

TO GAS COMPANIES, ENGINEERS, &c.

These Works are in full operation, and it will be the aim of the New Company not only to keep up the excellent workmanship of their predecessors, but, by the introduction of special machinery, to manufacture **Meters of a higher standard than is usually given, without increasing the cost.**

Special attention is invited to the Compensating Wet Gas-Meter of De Castro and Burton, which is now becoming so generally adopted, and is more simple in construction than any other Compensating or Ordinary Wet Meter. There is but one centre of friction to be overcome by the gas. By its self-adjusting principle it maintains an unvarying water-line; and the reservoir contains sufficient water to supply the Meter for twelve months without attention. It is unaffected by "tilting," and cannot be "flooded" by any pressure.

The Company also manufacture Dry Meters upon the most improved principle, and all their Meters being made to standard gauges, the most accurate measurement is obtained.

Attention is also called to their Dry Meters in Wood Cases, as used by some of the London Gas Companies. These Cases are a great preservation to Tin-plate Meters, especially in seaport towns, where the air is impregnated with salt; they are also particularly suited for export.

The Company repair or convert every description of Wet Gas-Meters to De Castro and Burton's Patent.

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WINDSOR IRON-WORKS, LIVERPOOL.

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Manufacturer of SELF-SUPPORTING GALVANIZED CORRUGATED, CURVED, and every kind of IRON ROOFING, CHURCHES, SCHOOLS, SHEDS, and IRON BUILDINGS.

WROUGHT and CAST IRON GIRDERS, BRIDGES, TANKS, &c., and all kinds of WIRE WORK, FENCING, GATES, HURDLES, &c., for Home or Abroad.

DIXON'S CELEBRATED SELF-SUPPORTING IRON ROOFS are specially suitable for Forges, Rolling-Mills, Iron-Works, Shipbuilding Yards, Mines, Collieries, Gas and Water Works, and for general purposes.

For Roofs with Timber Framing, DIXON'S GALVANIZED OR TARRED IRON SLATES form a durable and cheap covering, costing only about the same, when fixed, as felt and boards.

DRAWINGS, ESTIMATES, AND ILLUSTRATED CATALOGUES MAY BE OBTAINED ON APPLICATION.

MANCHESTER EXHIBITION — GOLD MEDAL — 1875 — SCIENTIFIC INDUSTRY

SIDNEY LEONI & CO.,

GAS ENGINEERS,

Patentees and Manufacturers of Registered Apparatus for Cooking and Heating by Gas, Complete Kitcheners for Families, Hotels, Clubs, &c. Ovens for Baking and Roasting. Grillers for Broiling. Boilers and Steamers for general use. The New Patent Tubular Safety Gas Boiler; also Heating and Ventilating Stoves, besides other Culinary and Warming Apparatus of their invention, and for which they have been awarded Prize Medals in 1871, 1872, 1873, and 1874.

They have also just been awarded by the Jurors of "The Exhibition of Appliances for the Economy of Labour," now being held at Manchester, the

GOLD MEDAL

For their collection of Patent Atmospheric Gas Apparatus, comprising New Patent Kitcheners for Roasting, Baking, &c., Steamers, Bath Boilers, Heating and Ventilating Stoves, Ornamental Drawing and Dining-room Fire Grates, and other Gas Apparatus, for their novelty, design, workmanship, and utility.

For Pamphlets on the "Advantages of Cooking and Heating by Gas," and Price Lists, &c., apply at the

Adamas Works, 54 to 66, ST. PAUL'S ST., NEW NORTH RD., LONDON, N.

London Depot: 74, STRAND, ADELPHI, W.C.,

Sole Licensees and Agents in Great Britain for

GIROUD'S PATENT RHEOMETER.

This Instrument is easily fixed under any burner; it regulates the volume of gas to be consumed, notwithstanding the size of the burner or the variations of pressure.

PRIZE MEDALS, 1862, 1867, 1871, 1874, 1875.

SOLE AGENTS and MANUFACTURERS of LOOKER'S PATENT WARMING and VENTILATING GAS-STOVES.

(Special Illustrations and Prices on application to our Works.)

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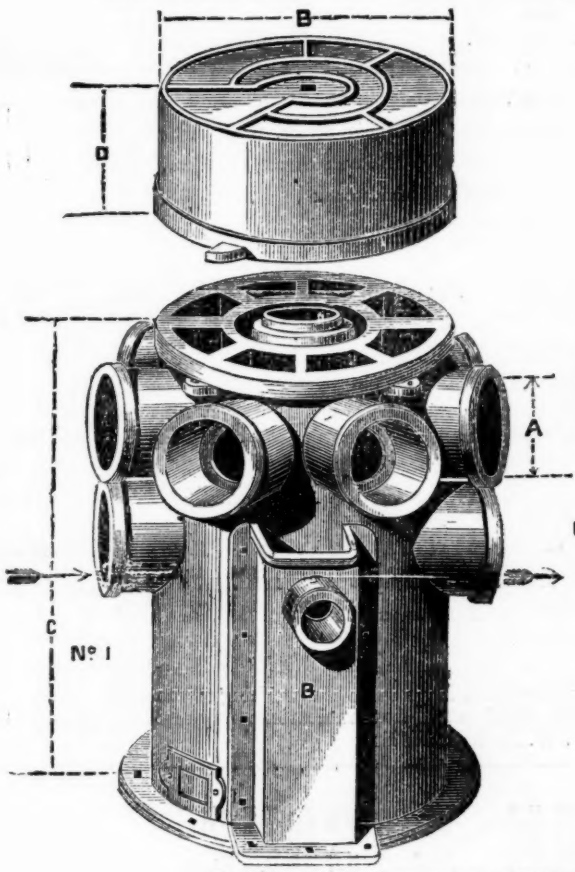
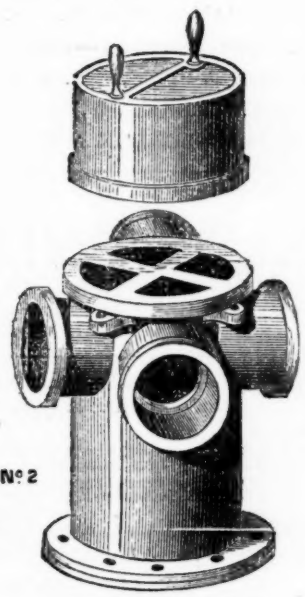
TO THE EMPRESS OF AUSTRIA THE COUNT OF FLANDERS &C

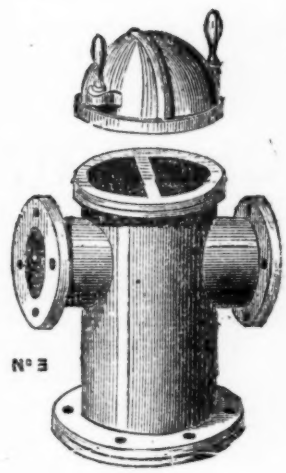
MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

IMPROVED CENTRE-VALVES.







THORNCLIFFE IMPROVED BYE-PASS VALVE. SIZES FROM 3 INS. UPWARDS.

THORNCLIFFE IMPROVED STOP-VALVE. SIZES FROM 3 INS. UPWARDS.

Sizes of the THORNCLIFFE IMPROVED CENTRE-VALVE.

	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
A. Bore of Pipe. . .	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 ..	12
B. Diameter of Body.	16 ..	20 ..	23 ..	26 ..	28 ..	31 ..	34 ..	40
C. Height of Tank .	33 ..	35 ..	38 ..	43 ..	46 ..	48 ..	51 ..	56
D. Depth of Cover .	8 ..	9 ..	10 ..	11 ..	12 ..	13 ..	14 ..	16
Total Height . .	44 ..	44 ..	48 ..	54 ..	58 ..	61 ..	65 ..	72

In all cases the Covers are cast heavy enough to resist any required pressure.

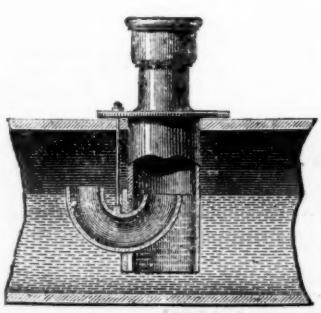
The advantages derived from the adoption of these Valves are so manifest and cardinal that in the immediate character of the change—the simplicity of the machine—the facility affording for cleaning out connexions between Valve and Purifier—the perfect collection and delivery by suitable overflow of the ammonia, at a greatly diminished depth from ground-line over the old form of Valve—the advantage of connecting on the same level, and at any angle, or opposite to each other, the inlet and outlet pipes without dip or rise—the clear acquisition of space in the purifying-house, by being able to place the boxes nearer together, the new Valve being entirely under the floor—and lastly, though of the greatest importance, the passage of crude and unpurified gas during the change is minimized to the merest fraction, thus preventing the fouling by impure gas the delicate machinery and easily affected exposed movements of the station-meter, thereby preventing the introduction of the enemy (unpurified gas) into the gasholder. Also a dead abutment is offered to all back pressure, imparting thereby to the gauges, governors, and hydraulic seals, a steadiness of action never realized with the once famous, but now fast becoming obsolete, Hydraulic Centre-Valve.

N., C., and Co. also Manufacture and Erect

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.



DIP-PIPE, No. 1.

Messrs. N., C., and Co. are also the Sole Agents for

HAWKINS' PATENT SELF-ACTING HYDRAULIC DIP-PIPES.

By their use the whole of the pressure caused by the Seal in the Hydraulic Main is entirely avoided, thus securing the many advantages long sought for.

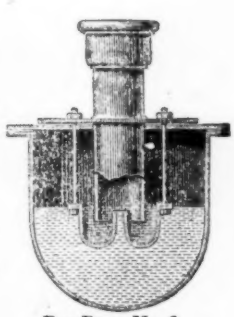
Over 50 Gas Companies have already been supplied with them, many of which have been using them throughout their entire works continuously for over two years.

They can be applied to existing Hydraulic Dips, and at a very small cost.

They seal themselves in the same manner as the ordinary dip-pipes, therefore they are not likely to get out of repair.

By the aid of the adjusting screws they can be made to work on the old principle at pleasure.

FOR PRICES, TESTIMONIALS, &c., APPLY TO



DIP-PIPE, No. 2.

Messrs. NEWTON, CHAMBERS, & CO., Thorncliffe Iron-Works, near Sheffield, Sole Agents;

OR TO THE PATENTEE,

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LIMITED.

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THE COMPANY ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

CHARGING AND DRAWING GAS-RETORTS,

And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

The advantages attending its use are—

INCREASED VOLUME OF GAS PER TON.
INCREASED YIELD PER RETORT.
INCREASED BULK OF COKE FOR SALE.
REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

A Pamphlet containing a description of the Machinery, and Copies of Reports on the working of the same, &c., will be forwarded on application to the MANAGING DIRECTOR, Maidstone. Communications may also be addressed to R. P. SPICE, Esq., or to F. W. HARTLEY, Esq.

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IRONFOUNDERS,

WORKS:

SPRINGBANK FOUNDRY & NORTH WOODSIDE FOUNDRY,

GLASGOW;

BONLEA FOUNDRY, STOCKTON-ON-TEES,

Manufacturers of

CAST-IRON GAS AND WATER PIPES.

SIZES: ¾ to 12 inches at GLASGOW.
„ 1½ to 7 „ STOCKTON.

A LARGE STOCK KEPT, AND PRICES MODERATE.

Freight to London, in the Stream, 10s. per ton from Stockton; 12s. 6d. from Glasgow.

JOSEPH AIRD,

WELLINGTON TUBE-WORKS, TIPTON, STAFFORDSHIRE,

MANUFACTURER OF

EVERY DESCRIPTION OF TUBING, GAS, STEAM, HYDRAULIC TUBES AND FITTINGS,
EITHER BLACK, GALVANIZED, OR ENAMELLED HOT WATER TUBES AND FITTINGS,
CORE BARS, COILS, COCKS (IRON OR BRASS),
CHANDELIERS, &c., GAS-FITTERS' TOOLS, GAS TONGS, STOCKS, TAPS, DIES, &c., &c.,
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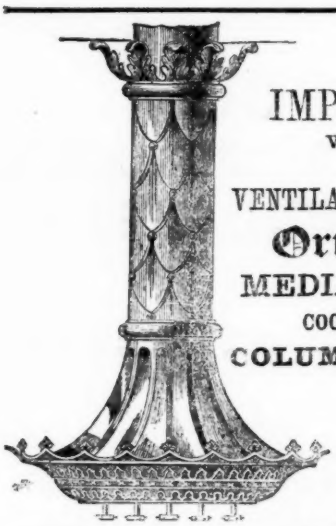

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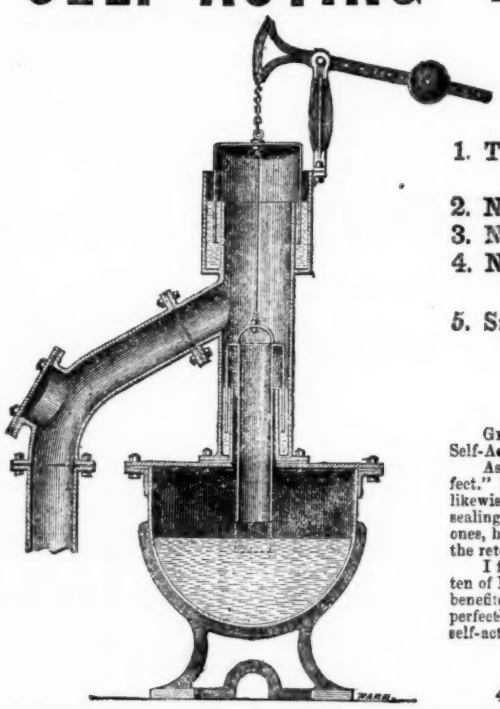

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TESTIMONIAL.

Metropolitan District Asylum, Caterham, Surrey, Dec. 14, 1874.

MESSRS. CHANDLER AND STEVENSON.

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I feel that it is quite unnecessary for me to say more on the subject, excepting that, having had ten of Messrs. Chandler's Dip-Pipes in use more than one year, and having experienced the great benefits derived thereby, inasmuch as the yield of gas from the coal is greatly increased, and the retorts perfectly free from carbon and other advantages, and seeing that the same Dip has been made perfectly self-acting by the second patent, I feel convinced that this is the right thing.—Yours obediently,

W. CRICKMAY, Resident Engineer.

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CONTRACTORS FOR PIPE-LAYING AND GAS-FITTING.

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Paris, 1867.

THOMAS GLOVER & CO.,

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METERS FOR MEASURING WATER.

CONTENTS.

	Page
Circular to Gas Companies:—	
Metropolitan Gas Affairs—A Retrospect	937
Legislation in 1875	937
Our Obituary	938
The Wardmotes and Gas Affairs	938
Gas Affairs at Leeds	938
Gas Affairs at Hanley	938
Water and Sanitary Notes:—	
Water Legislation in 1875	938
Metropolitan Water Affairs	938
Leading Article:—	
Gas and Water Legislation in 1875	938
Correspondence:—	
The Testing of Burners	940
Buenos Ayres Mutual Gas Company	940
Purification of Gas in Closed Vessels	940
Somerville's Automaton Register of Illuminating Power	940
Governors to Meter Lamps	941
Malam's Process of Gas-Making	941
Gas-Exhausters and the Deposit of Carbon in Retorts	941
Legal Intelligence:—	
High Court of Justice—Chancery Division—Patterson *v.* The Gaslight and Coke Company	942
Wirksworth County Court—Parkin *v.* Wirksworth Gas Company	946
Bradford Police Court—Illegal Connexion of Service-Pipes	946
Rochester Police Court—Committal for Non-Payment of Gas-Rents	946
Miscellaneous News:—	
A Christmas Appeal	940
Newport (Isle of Wight) Water Supply	940
Birmingham Gas Company	941
Meeting of the Georgetown (British Guiana) Gas Company	946
Meeting of the Chelsea Water-Works Company	947
Water Supply and the Prevention of Fires in the Metropolis	947
Iron and Coal Trades of Sheffield, South Yorkshire, and North Derbyshire	948
Iron and Coal Trades of South Staffordshire and East Worcestershire	948
Iron and Coal Trades of Lancashire	948
Coal and General Trade of the North	948
Trade Notes from Scotland	948
Poole Gas Supply	948
City of St. Petersburg New Water-Works Company, Limited	949
Testimonial to Mr. Dand	949
Institution of Civil Engineers	949
Society of Engineers	949
The Ventilation of Drains and Sewers and the Cleansing of House Cisterns	949
Register of New Patents:—	
Applications for Letters Patent	949
Patents which have passed the Great Seal	949
Patents which have become void	950

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 28, 1875.

Circular to Gas Companies.

The year, which is just coming to a close, will be chiefly memorable, in connexion with gas affairs, for another parliamentary attack on the metropolitan gas companies, by the local authorities. These bodies, dissatisfied with the working of provisions introduced and insisted on by themselves, once more sought the aid of Parliament, with the ill-disguised object of inflicting a serious injury on some of the metropolitan gas companies. The means by which this was to be effected was a "Regulations Bill," which, with some small modifications, eventually received the approval of a select committee of the House of Commons. The provisions of this measure must be so fresh in our readers minds, that they need not here be recapitulated. We have, however, to justify our opposition to this measure, and more especially to its chief feature, the sliding scale.

We take our stand on an existing statutory right, and, at the same time, admit the force of an existing statutory obligation. The right is to a certain maximum dividend: the obligation is to supply gas at the lowest price which will secure that dividend. When the right is enjoyed, and the obligation is fulfilled, the clear object of every special gas Act is fully accomplished. To speak our minds freely, we will say that, we see no special merit in fulfilling a moral duty. Some find it easy to be virtuous, and some, it may be, do not care to be virtuous. Virtue is said to be its own reward; and virtue rewarded with 10 per cent. has, we think, nothing to complain of. The avowed object of the sliding scale is to make gas companies virtuous by offering them the prospect of larger gains. But this is a reversal of all previous legislation, the object of which, as said above, has been to guarantee consumers a supply of gas at a price which will suffice for the payment of a given dividend.

It is with sincere regret that we find ourselves, on this question, in opposition to the opinions of some for whom we entertain the highest respect. There is much known to us, in relation to metropolitan gas affairs, which cannot be narrated and discussed in these columns. If we had the case of the South Metropolitan Company only to consider, we might readily admit that a fair case could be made out for conceding some exceptional advantages. But we have the whole of the companies to consider, and not only the companies, but the consumers also; and, having given the fullest and fairest consideration to the interests of both, we have arrived at the conclusion to take our stand on existing legislation. We should have preferred the extension of the legislation of 1868–9 to the whole of the metropolis; but, as the revision clauses are the cause of so much offence to those who promoted them, we sketched, a few weeks back, some modifications of the Act of 1860, which, while confirming the rights of the companies, might make it more easy to enforce the rights of consumers. These latter, we need hardly mention, have hitherto been considered to be, the right to all profits in excess of those required to pay maximum dividends, and make up the several funds for which parliamentary sanction has been obtained. To abrogate this principle would be to throw all past gas legislation, which is based upon it, into confusion.

Nevertheless, if Parliament should so will, we shall make no further objection to the sliding scale, or anything that it involves. We have simply discharged what we consider to be our duty, when we have pointed out the differences in the past and the proposed legislation, as they affect both consumers and companies. Let us hope that all will be amicably arranged in the course of the year about to open, and that, for the remainder of their existence, the metropolitan gas companies will enjoy peace and prosperity.

We may, at the beginning of the New Year, speculate once more on the course which legislation may possibly take in the future. To-day we have only to deal with the past. The only Metropolitan Gas Act passed last session was that which amalgamated the Ratcliff with the Commercial Company, and introduced some provisions perfectly new in gas legislation. For the first time the sliding scale of dividend finds itself enacted, and it is further provided, that so long as a certain standard price for gas is not exceeded, the company may accumulate any amount of reserve-fund they please. The insurance-fund is not to exceed one-twentieth of the paid-up capital; but there is no limit to the reserve-fund. The other novel feature is, that the company are to raise their further capital half by way of new shares, and half by way of loan, the latter at interest not to exceed 5 per cent. Lord Redesdale had his little joke, and supposing the standard price of 3s. 9d. per 1000 feet only charged, the dividend on the new capital is not to exceed [illegible] per cent. The company now come under the supervision [illegible] the public auditor, who is required, with all practicable [illegible], to investigate the accounts of the company [and ce[illegible]] to the amount of capital, commencing, we presume, with the capital account as settled by the Act of 1852.

We do not, of course, suppose that the sliding scale, in the case of the Commercial, or any other company, will have a long career. Purchase is, no doubt, imminent, and in that (since we cannot have a general amalgamation), we regret to say that we see the only solution of present difficulties. Of one thing, however, we are perfectly satisfied, that a few years working of the sliding scale, if the times continue favourable, will produce a louder outcry than ever against what has been called the extortion of the gas companies.

Legislation, in the case of provincial companies, has followed its ordinary course. All new capital has been limited to the usual rates of 7 per cent. for ordinary, and 6 per cent. for preference. Only the ordinary borrowing powers have been allowed in any case. The single novelty was that proposed and carried by the Bath Gas Company, who, instead of borrowing money, will raise a portion of their share capital at 5 per cent. This course we have before recommended to the notice of companies, and we need not here dilate on the advantages it seems to offer.

The past year will also be distinguished on account of the largest gas purchase ever made by a corporate body. We allude, of course, to the acquisition of the two undertakings by the Corporation of Birmingham. Regretting, as we always do, the absorption of a gas company by a municipal authority, we are, nevertheless, bound to say, that the purchase of the two Birmingham Companies was settled on most satisfactory terms. The Corporation are enterprising and just. The shareholders of the companies receive the full value of their investments, and the consumers of Birmingham, we may hope, will profit by the transfer. If we had a Corporation in this metropolis who would treat for the companies in the same liberal way, they might be bought to-morrow. But, unhappily, we have not a Corporation, and the men who scheme in London are of a very different calibre to those who rule in Birmingham. The only other purchase that need be alluded to is that of the Inverness Gas and Water Company, by the Commissioners of that burgh. Not having a full statement of the affairs of the company before us, we are unable to pronounce a decided opinion; but, in all probability, the consideration money—£153 for every £100 of capital, with the repayment of a sum expended out of profits—is a fair price for the undertakings. On the whole, then, we may say that, outside the metropolis, the events of the past year have not been detrimental to the interests of gas proprietors. The metropolitan embroglio still remains, and its disentanglement is a thing of the future, to be speculated upon next year.

We have had no great discovery to chronicle in the past year, but it must not be supposed that no progress has been made in our profession. A number of inventions have been brought into notice, most, it must be admitted, still on trial, which promise us either a larger yield of gas from coal, or gas of greater purity. The British Association of Gas Managers held a most successful meeting, and the paper read thereat by Mr. Cleland, on "The "Economy of Force in Gas-Works," is certain to bear fruit in the future. Mr. Livesey's "Exposition of Hills's Process for "Purifying Gas" will, no doubt, induce other managers to give the system a trial.

Our obituary is happily short. Passing over the names of some whose memory must be dear to mourning friends, we may mention Mr. J. E. Clift, who, many years ago, made his mark as a gas manager, and devoted himself with much success to the purification of gas. By the death of Mr. Jabez Church, the gas world lost an accomplished engineer and a most amiable man. Mr. T. H. Methven, whose decease we have also had to record, belonged to a family who have greatly distinguished themselves in the management of gas undertakings, he not being the least distinguished among them. And so we end a very brief review of the events of the past year.

The gentlemen who came forward in the City of London on St. Thomas's Day, to be elected to eat about twelve dinners each, in the course of the next year, at Corporation expense, did not, this time, orate much on gas affairs. The subject is stale, and, perhaps, unprofitable; and we have a shrewd suspicion that some regret the day they were induced to take it up, and supinely follow the lead of the Metropolitan Board of Works. Some show of work, however, must be made, and Corporation money must, somehow or other, be got rid of—and it cannot all be eaten—so the coming Gas Committee will, no doubt, next year, find plenty of employment for a number of highly deserving parliamentary barristers, agents, and others. The result we shall know in the course of time; but, whatever it may be, we do not expect that it will at all justify the cost of its accomplishment.

We are glad to find, from a report by Mr. H. Woodall, that the complaints made of the quality of the gas supplied by the Corporation of Leeds are without foundation. It seems that the burner most commonly used in Leeds is the iron tulip, No. 3, which, in Mr. Woodall's experiment, gave the light of only six candles, with a consumption of five feet per hour. At the same rate of consumption, a Brönner (No. 5) showed the light of 20·16 candles, and a Bray (No. 8) 19·12 candles; Nos. 4 and 6, by the same maker, showing 15·9 candles. Tested by the standard burner, Sugg's "London" Argand, at the usual rate, the gas was found to have the illuminating power of 21·5 candles. Mr. Woodall has, very sensibly, opened a sort of exhibition at the gas office, at which the qualities of the several burners are demonstrated. The consequence will, no doubt, be an extensive change of burners, and a cessation of the complaints.

Great complaints have also been made of the quality of the gas supplied by the British Gas Company at Hanley. The gas examiner reports that the average illuminating power in the month of November was 12·76, or nearly two candles lower than the lowest average he had on record. The sulphur impurity was also great, amounting to an average for the month of 35 grains per 100 feet. A resolution was passed by the Town Council to take proceedings against the company, but as the quality of the gas has since been improved, and the notice to the company was defective, that resolution has been rescinded. There appears to be a desire on the part of the Town Council of Hanley to purchase the undertaking. Some idea of the difficulty of maintaining an efficient gas supply in a district like that of Hanley may be gathered from a fact mentioned at the council meeting—viz., that in one week, quite recently, six large mains had been fractured.

Water and Sanitary Notes.

There is but little calling for notice in the water legislation of the past session. The domestic rates, it will be seen, whether the undertaking is in the hands of a Company or Corporation, are per centages on "rack-rent or annual value," with the usual extra charges for closets more than one, and baths. The incorporating Acts are careful to provide, that a domestic supply does not include water for a garden, or for washing carriages, &c. This is perfectly fair. On the intermittent system it does not very much matter, for if a man chooses to empty his cistern in watering his garden, and thereby leave the house without water, perhaps for twelve hours, the inconvenience is his own. But where a constant supply prevails, it is absolutely necessary, in the general public interest, that some restrictions should be placed on consumption in the summer months, when the supply is likely to fall short. It will be seen, also, that in most of the Acts we have mentioned, provisions are inserted in contemplation of, at no distant period, a pretty general supply of water by meter. Such a practice ought to follow the introduction of the constant system; for it may be admitted that some of the contrivances introduced by companies, to prevent a too large consumption—such as the ferrule, which makes it impossible to get a pailful of water in less than several minutes—are rather tiresome to servants and housekeepers. Such arrangements, too, may defeat their object; for a servant would be apt to put a pail under a tap, and leave it there, returning in half an hour or so, to see how the process of filling was going on. Meanwhile, and in her absence, a pailful or two might have overflowed and gone to waste.

The remedy for all this is, of course, the adoption of the meter system. One obstacle, and the chief one, to the introduction of the system, has been the want of a suitable meter of an inexpensive kind, and adapted for supplies at all pressures. The meter contrived by Mr. Richards, the inventor of the dry gas meter, and described in our columns last week, will, we think, supply the long-felt want. Having seen one in operation, we feel at liberty to express an opinion that its action can be perfectly relied upon. An objection, we know, has been made to the material of which the diaphragms are composed—red rubber—which, it is alleged, is liable to decay. Now, red rubber can be obtained of various qualities. There are some which contain 70 or 80 per cent. of mineral matter. Such a material would be obviously unsuitable for Mr. Richards's purpose. But good red rubber, with a minimum amount of mineral matter, has been largely used for pump-valves, for both hot and cold water, and has been found to possess extraordinary durability. When the dry gas-meter was first introduced, it was alleged that the leathern diaphragms would quickly decay. Experience has, however, shown that these are the most durable parts of the apparatus, and such, we believe, will be found to be the case with the red rubber diaphragms of the water-meter. The fault has been found with some water-meters, that they "knock to pieces" when working under high pressure. Accidents of this kind cannot occur with the Richards meter, for a lip-valve is arranged to control the pressure, before the water gains access to the meter. Altogether, we believe we may safely pronounce, that this meter is one of the very best invented for accurately registering the consumption of moderate amounts of water, and we think it deserves the attention of water engineers and companies.

At one of the recent wardmotes in the City of London, a strong protest was made against the present mode of levying the charges for water. Perhaps it was not known, at the time, that the New River Company had resolved not to avail themselves of their legal rights in connexion with the new assessments. It is calculated that the City assessment will be raised to £3,000,000 in April next, which is just about double what it was ten years ago. It follows that the New River Company might, if so minded, double the income they derive from the City, while, it is likely to be the fact that, the consumption of water in the City is not more than it was ten years ago. But, as we have said, the company have no intention of doing anything of the kind. We have reason to believe that no one of the metropolitan water companies intend to avail themselves of the right they will acquire next April, except in cases which will fully justify the additional charge. Nevertheless, the companies are firmly united to resist any change in the basis on which their rates are fixed.

GAS AND WATER LEGISLATION IN 1875.

Gas Orders.

The following companies obtained Provisional Orders from the Board of Trade, under the Gas and Water Works Facilities Act, 1870, which, having been confirmed by an Act of Parliament, have all the force of special Acts:—

The *Blackburn Gas Order* gives the company power to raise £120,000 additional capital, and confers the ordinary borrowing powers in respect of it. The dividends on this new capital are limited as usual.

The *Brighton and Hove Gas Order* empowers the company to raise £50,000 additional capital, with the customary borrowing power. The dividends are limited as usual.

The *Littlehampton Gas Order* is granted to a "limited" company, who have already raised capital to the amount of £5300, and are now authorized to raise £1700 additional. On this latter sum the dividends are limited to 6 per cent. or 7 per cent., according as the capital is issued as preference or ordinary, which shows the microscopic attention which Parliament pays to the profits of gas companies. Gas of 14-candle power is to be supplied, and the price is not to exceed 6s. per 1000 feet.

The *North Bierley Gas Order* authorizes the company to raise £35,000 additional capital, carrying the usual borrowing power. The dividend on this additional capital is, of course, limited to the usual rates. Fourteen-candle gas is to be supplied, the maxi-

mum price remaining the same as fixed by the North Bierley Company's Act, 1863.

The *Weymouth Consumers Gas Order* empowers the company to raise £10,000 additional capital, and to borrow to the usual extent. The dividends on the additional capital are limited as usual.

The *Wolverhampton Gas Order* authorizes the company to issue new capital to the amount of £49,480, and to borrow to the usual extent. The dividend on this new capital is limited to 6 per cent., however it may be issued.

Water Orders.

The *Bognor Water Order* authorizes a limited company to raise £10,000 for the purpose of buying land, sinking a well, and doing all that is necessary to supply water to Bognor. The rates for domestic purposes are to be a per centage on "rack-rent," with extra charges for closets and baths. All the usual powers of a water company are conferred by this Order.

The *Newington (Yorkshire) Water Order* authorizes a limited company to raise capital to the amount of £70,000 to supply water in an extensive district near Hull. The rates are as usual a per centage on annual "rack-rent," and the Order confers all the ordinary powers for the prevention of waste, &c.

The *Newport (Isle of Wight) Water Order* authorizes a limited company to raise £10,000 to supply Newport with water in the parish of Carisbrooke. The domestic rates vary as the service is low or high, with variable rates for closets and baths.

The *Bridgend (Glamorganshire) Gas and Water Order* simply empowers the company to raise £18,000 additional capital, and borrow to the usual extent.

Water Acts, 1875.

The following Acts incorporate companies with power to supply water :—

The *Broadstairs Water Act* dissolves and re-incorporates a limited company with an original capital of £10,000, and who are by this Act empowered to raise further capital to the amount of £5000, the dividends on which latter are limited to the same rates as gas capital. The rates are fixed at 6¼ per cent, on annual "rack-rent," with the usual extra charges for closets and baths. The supply is from a well, and is to be constant.

The *Busby Water Act* incorporates a new company formed to supply water to a district in the counties of Lanark and Renfrew. For this purpose the water of several small streams may be impounded. The capital is £10,000, carrying the usual borrowing power. The rate for domestic purposes is 1s. 6d. per pound of the "full annual value," with extra charges for closets and baths. Power is given to make and enforce stringent regulations for the prevention of waste, &c.

The *Maidenhead Water-Works Act* incorporates a company, with a capital of £20,000, carrying the usual borrowing powers, to supply water, obtained from a well in the parish of Cookham. The rates are a per centage of "rack-rent," varying according to the value, with the usual extra charges.

The *Market Rasen Water Act* incorporates a company, with a capital of £10,000, and the usual borrowing power, with authority to supply water from some springs. The domestic rates are per centages on annual value, with the usual special charges.

The *Millom Gas and Water Act* should have been noticed before, but was accidentally passed over. It incorporates a company, with a capital of £40,000, and the usual borrowing power, with authority to supply gas and water to the townships of Millom Below and Chapel Sucken, in Cumberland. It is provided in the Act that the local authority of the district may take over all the powers of the Act, upon paying the expenses incurred in obtaining it, and any capital sums expended by the company subsequently, with 5 per cent. interest. The gas supplied is to have the illuminating power of 14 candles, and the price is not to exceed 6s. per 1000 feet. The Act confers all the ordinary powers in connexion with the supply of gas and water.

The *Portishead District Water Act* incorporates a company, with an original capital of £32,000, and with power to raise £16,000 additional, both carrying the customary borrowing power. The rates and charges fixed by the Act are about the same as usual.

The *Stroud Water Act* incorporates a company with a capital of £72,000, and the usual borrowing power. The rate is an uniform charge of 6 per cent. on annual "rack-rent," or if supplied by meter, 1s. 6d. per 1000 gallons for the first 50,000 gallons, and 1s. per 1000 gallons for any quantity beyond.

The *Truro Water Act* incorporates a company, with a capital of £16,000, carrying the usual borrowing power. There is nothing unusual in the provisions of the Act, except that power is given to sell the undertaking by agreement to the Corporation of Truro within three months of the passing of this Act, and it is further enacted that if the Corporation make no offer within the period aforesaid, the company shall not oppose an application by the Corporation next session for power to purchase by arbitration. The water squabble at Truro has been repeatedly noticed in our columns, and it will be seen, from a report in our last number, that the works have been undertaken.

The *Worksop Water-Works Act* incorporates a company, with a capital of £12,000, and the usual borrowing power, with authority to supply water from a well to the parish of Worksop. It is provided that the Local Board may at any time acquire the undertaking on giving six months notice of their desire to do so, it being understood that the company "shall be considered vendors "by agreement and not by compulsion." The rates and charges are about the same as usual.

The above Acts confer all the powers that are ordinarily granted to water companies. Most of them provide for the possible future supply of water by meter, and, in that event, contain provisions analogous to those contained in Gas Acts in connexion with gas-meters.

The following Acts confer further powers on water companies already incorporated :—

The *Chelsea Water-Works Act* authorizes the company to raise £160,000 additional capital, and to borrow £40,000 for purposes well known to our readers. The Act provides that the company shall not take from the Thames more than 20 million gallons of water in any 24 consecutive hours.

The *Eastbourne Water-Works Act* converts the original capital of the company (£11,600) into stock, and authorizes the issue of "improvement stock" to the amount of £29,000, which appears to have been all taken up by the Duke of Devonshire. Further than this, the company get power to raise additional share capital to the amount of £30,400, carrying the usual borrowing power. The dividend on the new stock and share capital is limited to 7 per cent.

The *Kilmarnock Water Act* empowers the company to raise £10,000 additional capital, and borrow to the usual extent for the construction of new works. The dividends are limited as usual.

The *Leicester Water-Works Act* authorizes the company to raise £100,000 additional capital, and to borrow as usual one-fourth of that amount. As the Leicester water supply will occupy the attention of Parliament next session, this Act need not be further noticed.

The *Pontypridd Water-Works Act* gives the company power to raise £30,000 additional capital, and to borrow as commonly allowed. The dividends are limited; but it is arranged that the original capital shall have a higher rate than the new, if the profits permit.

The *Slough Water-Works Act* reconstitutes the company with a capital of £20,000, carrying the usual borrowing power. It also provides for the sale and transfer of the undertaking to the Local Board on such terms as may be agreed upon, making all necessary provisions for the transfer of the company's powers to the Board.

The *South Staffordshire Water-Works Act* authorizes the company to raise £200,000 additional capital, and to borrow to the usual extent, for the construction of new works of an extensive character. It also provides that within five years the company shall give a constant supply to the whole of the borough of Walsall. The dividends on the new capital are limited as usual to 7 per cent. or 6 per cent., and it is expressly provided that the original capital shall not receive more than 6 per cent., nor shall any back dividends be paid so long as the company's charges in the district of the extinct Dudley Water Company exceed the rates sanctioned by the Act of 1853.

The *Weardale and Shildon District Water-Works Act* authorizes the construction of extensive new works, and empowers the company to raise £600,000 additional capital, carrying the usual borrowing power.

The next two Acts authorize the purchase of water undertakings by Corporations.

The *Birmingham Corporation Water Act* has been so often noticed in our columns, that it need only be mentioned here.

The *Blackburn Water-Works Act* primarily authorizes the company to raise £200,000 additional capital, and to borrow, as usual, one-fourth of that amount. The dividend on the new capital is limited to 7 per cent. The Act then goes on to confirm an agreement entered into between the company and Corporation of Blackburn, in virtue of which the undertaking is transferred to the Corporation. The consideration is the payment of annuities in respect of ordinary share capital at the rate of 9 per cent. for the next five years, and thenceforward in perpetuity at the rate of 9½ per cent. Preference capital is to receive 4½ per cent. The purchase was to take effect on the 1st of July last.

The next two Acts empower authorities to start new undertakings.

The *Ossett-cum-Gawthorpe Local Board Act* authorizes the Board to construct all necessary works for the distribution in their district of water, which they are to purchase from the Corporation of Batley, at the rate of 8d. per 1000 gallons. Beyond this, the Act gives the Board all the usual powers in relation to water supply, and authorizes them to borrow £20,500 in respect of the undertaking.

The *Pemberton Local Board Water Act* authorizes the Board to borrow £34,000, for the construction of new water-works, much required in the district. The domestic rates are to be the usual per centages on "rack-rent."

The following Acts give additional powers to local authorities in relation to water supply:—

The *Ashton-under-Lyne, Stalybridge, and Dukinfield District Water-Works Act* simply gives the joint Boards another three years for the execution of the works authorized by the Act they obtained in 1870.

The *Greenock Water Act* authorizes the Water Trust to borrow a further sum of £65,000 for the extension of their water undertaking.

The *Hamilton Water Act* transfers the water undertaking from a body of Commissioners to the Magistrates and Town Council of the burgh, and authorizes these latter to borrow £8800 for new works.

The *Manchester Corporation Water-Works and Improvement Act* authorizes the Corporation to borrow a further sum of £500,000 for extending their water-works. We find, also, that the Act gives power to raise an additional sum of £250,000 for the new gas-works. For the future the surplus gas profits, which have hitherto been applied to the improvement of the township of Manchester, are to be applied, as the council may think fit, towards the improvement of the whole city. The Act further authorizes some street improvements, and gives general powers to the Corporation, which are only of local interest. In the aggregate, the Act empowers the Corporation to incur an additional debt of about a million and a quarter.

The *Oldham Corporation Water Act* provides that the Corporation may relinquish and abandon certain works authorized by their Act of 1870, and construct others and different, for which purpose they have power to borrow a further sum of £250,000.

The *Oxford Corporation Water-Works Act* authorizes the Corporation to construct a new reservoir, and connect it with their present pumping station at Hinksey. For this purpose, the Act gives them power to spend £19,000. After the 1st of July next, the domestic rate is not to exceed 6 per cent. on annual "rack-" rent," with 10s. a year for each closet more than one, and a like sum for every bath. The Act confers some stringent powers on the Corporation, for making and enforcing regulations, &c.

The *Rochdale Improvement Act* empowers the Corporation to borrow a further sum of £200,000 for water-works purposes. This Act authorizes a domestic rate of 10 per cent. on the annual value of houses above the annual value of £6. Further powers are conferred, which are of only local interest.

The *Rotherham Corporation Act* empowers the Corporation to borrow £30,000 for water purposes. No new works seem to be contemplated, the money being required to enable the Corporation to carry on their present undertaking. The Act further authorizes some local improvements.

A CHRISTMAS APPEAL.—It has recently come to the knowledge of the conductors of this JOURNAL that the wife and four children of a gas and water works manager, in one of the Midland Counties, are in a state of great privation, owing to the long and severe illness of the head of the family. Careful inquiries have been made respecting the case, and it is believed to be one on behalf of which we are justified in appealing to the sympathy of our readers at this hospitable season. Prompt assistance is much needed, to meet the most pressing necessities, and when these are relieved, an effort will be made to enable the wife to start in some little business in the town in which she is known, and thus earn a living for those dependent upon her, the state of the husband's health precluding the hope of his ultimate recovery. The publisher of the JOURNAL OF GAS LIGHTING will be happy to receive subscriptions, however small, and will undertake their proper application. Sums already promised:—

Mr. G. W. Stevenson	£2 2 0
Mr. W. Haywood	2 2 0
Mr. W. B. King	2 2 0
W. T. F.	1 1 0

NEWPORT (ISLE OF WIGHT) WATER SUPPLY.—The Corporation of Newport have offered to give £8225 for the undertaking of the water company, which sum is £225 less than the company expressed their willingness to sell at. The offer of the corporation is made on the basis of giving £35 each for the 135 shares of the company, £2500 for the purchase of a mill and land belonging to them, and £1000 for the expense of obtaining a Provisional Order to carry out the arrangements. The directors have not yet decided upon the acceptance or rejection of this offer. The corporation have resolved to apply to the Public Works Loan Commissioners for a loan, on the security of the rates of the district, to complete the purchase.

Correspondence.

THE TESTING OF GAS-BURNERS.

SIR,—It is from such valuable reports as that supplied to the Gas Committee of the Leeds Corporation by Mr. H. Woodall, which appeared in your issue of the 21st inst., that the education and enlightenment of Gas Committees in particular, and the public in general, as to the best methods of consuming gas, will be sure to come.

The enormous waste incurred by the use of certain burners is clearly shown in Mr. Woodall's table; but there seems to be an important element omitted in regard to the testing of the burners, which must always be taken into account when making comparisons—that is, the pressure of the gas at the point of ignition.

With rich cannel gas, such as we have in Scotland, pressure has not such a strongly-marked influence in deteriorating the illuminating power; but when we leave gas of from 26 to 30 candle power, and come down to that of from 14 to 20, the influence of pressure on the economy of consumption is very marked indeed; sufficiently so, perhaps, to account for some of the results presented by Mr. Woodall. We see from his table that with a Brönner wide-cut batswing, burning 5 cubic feet of gas per hour, the candle power developed was 16·41, while with a Brönner fine-cut batswing the candle power was only 11·93. Here are two burners by the same maker giving very different results, and the natural question is, why? It would be interesting to know if these burners were tested under the same conditions as to pressure, and also what pressure was used in consuming the gas burned by the No. 3 tulip burner, which only gave an illuminating power of 5·25 candles.

Nothing would sooner bring about a revolution in the method of consuming gas, or teach the public how to get, as nearly as practicable, the theoretical value from it, than the simple and, to the general public, intelligible method Mr. Woodall proposes. Were gas companies to display in their windows, or inside their offices, a number of specimens of good burners, consuming gas under favourable conditions, and having cards stating in large characters the rate of consumption of each particular burner, reference from the card to the size and power of the flame would soon educate the eyes of those who take an interest in the matter as to what sort of light they should have in their houses or business premises.

How often is the quality of the gas blamed, when the fault lies entirely with the burner and the pressure at which the gas leaves it. And the loss and inconvenience of bad light are not the worst of it, but the imperfectly consumed gas goes to vitiate the air, and make the unhealthy and oppressive atmosphere so well known, and so characteristic of many places where gas is largely consumed, clearly showing that little attention has been given to choosing proper burners, or modifying the pressure to suit the quality of the gas.

It is to be hoped that Mr. Woodall will carry out further his valuable experiments, and give to the readers of the JOURNAL OF GAS LIGHTING the benefit of his labours.

D. BRUCE PEEBLES.

Fountainbridge Works, Dec. 24, 1875.

THE BUENOS AYRES MUTUAL GAS COMPANY.

SIR,—No. 644 of your JOURNAL published an extract from the *Buenos Ayres Standard*, respecting the Mutual Gas Company of that city, in which it was stated that the said company held a net profit of 65,380 pats. which they proposed distributing among the shareholders. I replied in No. 646, saying that no such profit could be held, as it was more than the total sum collected.

The following, from the weekly number of the *Buenos Ayres Standard*, Nov. 10, 1875, I think, throws some light on the subject:—"There is a great hubbub in the market about the Mutual Gas Company refusing to pay dividend on the shares held in London; it seems there are 17,000 shares in England, and only 3000 here. We certainly wonder that the representatives here of the English shares do not take some proper action in so serious a matter, under the present rule the dividend declared amounts to *nil* for foreign holders; rather a sharp business this."

I consider it right to repeat, that the company I represent is quite distinct from the Mutual Gas Company, *alias* Buenos Ayres Gas Company, Limited.

LOUIS WILDE.

Agent for the Buenos Ayres Gas Company,

4, *Cable Street, Liverpool, Dec.* 24, 1875.

PURIFICATION OF GAS IN CLOSED VESSELS.

SIR,—The three communications which have recently appeared in your columns from the pen of Mr. George Anderson contain a large amount of useful information conveyed in a very few words, which, according to my opinion, entitle that gentleman to the thanks of the gas profession generally. This is specially true of his description of a scrubber, which, in theory, appears superior to all others, for the following reasons:—First, on account of the extensive surface (compared with the size of the vessel) exposed to the action of the water, and, of course, available for the purification of the gas. Unlike the coke scrubber, in which the water often flows only in one particular channel, so leaving a large portion of the surface inactive in the vessel, the whole area of the canes, &c., is brought continuously into action. The liquor can be retained within the scrubber, whether it be large or small, until it attains the desired strength. By the small interstices in the cane-work or brushwood, the gas, in passing, will deposit a portion of its impurities through the mechanical action of friction. The vessel can be made of moderate height, thus diminishing its expense, and is available alike in the largest, as in the smallest, of works.

It is always gratifying to be enabled to speak favourably of any new invention, and that of Mr. Anderson is so promising as to give cause for indulging in that feeling; but as I do not wish to be considered a panegyrist of the inventor, I must sign myself

"AN OUTSIDER."

SOMERVILLE'S AUTOMATON REGISTER OF ILLUMINATING POWER.

SIR,—The great difficulty in making Mr. Somerville's automaton an efficient substitute for the photometer at present in use, seems to be the trouble of ascertaining the amount and effect of the carbonic acid, moisture, and air extracted from the gas previous to its being weighed.

I do not think a more accurate method of testing can be desired than

that obtained by the use of the improved Letheby photometer. Still, I think Mr. Somerville's ingenious adaptation should, with slight modifications, give a fair approximate of the illuminating power, and, being also self-acting and self-registering, would prove of great value to gas managers and others.

If a series of testings between Somerville's apparatus and the ordinary photometer were taken at the works where the two instruments were in action, from their variations a scale might be devised by which the automaton could be regulated. In a well-managed works the amount of carbonic acid, &c., in the gas from day to day would not vary much.

Lowe's jet as an accurate register is open to some of the same objections as Somerville's instrument, and one of your correspondents consequently says it (the jet) is "altogether misleading." Now, no one would think of comparing the jet with Letheby's photometer, for absolute accuracy; but from practical experience, having tested the one against the other for a length of time, I can testify that, though there is a variation between then, it is not of such a serious nature as to warrant one calling the jet altogether misleading.

The friction caused by the action of the spring on the pencil might be considerably lessened by dispensing with the spring altogether, and substituting for the pencil a fine camel's-hair brush, saturated or kept saturated with some thin colouring matter.

Ripon City Gas-Works. ROBERT DARNEY, Jun.

SIR,—May I ask Mr. Somerville, why the end of the balance-beam shown in his gas-tester, illustrated by you on the 30th ult., is induced to move through an equal space for every increment of weight in the gas receiver?

I myself should imagine that as soon as the weight of the receiver exceeded the weight of the counterpoise, the beam would at once descend to its lowest point, and remain there until the counterweight preponderated, when it would move over to the other extreme. This, I think, might be remedied by placing a small weight at the end of a finger at right angles to the beam, so that, as the latter tilted, the weight would move away from the centre, and so oppose a gradual resistance to the movement of the beam. A MECHANICAL ENGINEER.

GOVERNORS TO METER LAMPS.

SIR,—Perhaps some brother gas managers would not deem it out of place to inform me (through your JOURNAL) whether it is customary to set the governors attached to meter lamps at a lower pressure than those of the non-meter lamps, to allow for the pressure taken off by the working of the meter. As the average meter system is likely to become general, this point may be worth knowing to others as well as myself; and, taking into consideration that public bodies having the control of the lamps are (under the system) making such enormous savings, it seems that this point should at once be put straight. R. W. BRETT.

Gas-Works, Hertford, Dec. 18, 1875.

MALAM'S PROCESS OF GAS-MAKING.

SIR,—I observed, in the report of proceedings of the last meeting of the West of Scotland Association of Gas Managers, that a committee was appointed to visit the works of the Dumfries Gas Company, with a view to analyze Malam's system of gas manufacture; and that the report of the committee was to be inserted in the columns of your JOURNAL, for the benefit of the "gas world." As managers are now contemplating repairs and extensions for the ensuing spring, they would be glad to be made aware, in a future issue, the date when the expected report is likely to appear. GASCON.

GAS-EXHAUSTERS AND THE DEPOSIT OF CARBON IN RETORTS.

SIR.—I hope Mr. Joseph Tysoe will pardon me for making a few remarks on his communication to you of last week anent his belief as to the cause of carbon deposit on the inside of gas-retorts, and the influence of exhausters in preventing this deposit.

I am induced to do this, because, at first sight, his reasoning appears both plausible and logical, and therefore the more liable to mislead.

If I understand him aright, his idea is that the true cause of carbon deposit is the difference in the diffusibility of the various products from the destructive distillation of coal, or, as he put it, the degree of dialysis possessed by the different gases inside the retort—that in consequence of the hydrogen possessing this property in a very high degree, it parts from its carbon, and passes through the porous clay retort, leaving the carbon behind. He illustrates this by alluding to a small instrument, consisting of a cup made of iron, having a disc of porcelain hermetically fitted over it, the cup being filled with mercury, and connected by a vertical glass tube or gauge. By causing a stream of coal gas or carburetted hydrogen to impinge on the porcelain plate, the mercury at once rises in his instrument to the height of one inch, equal to 13 inches of water. He says this is caused by the hydrogen passing through the pores of the plate, and thereby increasing the elasticity of the air within the cup. The carbon does not possess this property, and therefore remains behind. He then goes on to say that it is in precisely the same way that the carbonaceous deposit inside the retort is formed, the hydrogen passing through the porous clay of the retort, and the carbon being left behind.

Now, this description is very misleading; and any one not conversant with the facts of the case would infer that in the event of a hydrocarbon, say olefiant gas, being streamed on the porcelain plate of the instrument referred to, it would immediately be decomposed into the elements of which it is composed, the hydrogen passing through the porous porcelain, and the carbon being left behind, on the surface of the plate, as solid graphite. Such would by no means be the case; and it would only be in the event of the gas being a mechanical mixture of hydrogen and carburetted hydrogen gases that the hydrogen would pass through the plate. But even this is not altogether true, for the carburetted hydrogen gas would also pass through, although to a less degree, in consequence of its lower diffusibility. In no case would carbon be deposited at ordinary temperatures. Another very material mistake made by Mr. Tysoe in his description of the action of his instrument is, that the increased volume of the gases is caused by the hydrogen alone passing in; whereas the fact is that it is caused by the hydrogen having a higher diffusing rate than air, and passing in through the porcelain plate more quickly than the enclosed air passes outward.

Such being the case, then, the whole theory of carbon being produced from this cause falls to the ground, because before the hydrogen can come into possession of this high diffusibility, it must be in the form of the simple element, not in combination. We must, therefore, look further for the primary cause of carbon deposit, and find the power or condition which induces this decomposition or breaking up of the elements, hydrogen and carbon. This, as I stated in my previous letter, is the high temperature employed in carbonizing coal.

If further proof be required that the primary cause of carbon deposit is the decomposition of the hydrocarbons by high heats, and not by the atomolysis of gases by means of the porous clay, we have only to remember that at a dull red heat the diffusibility of gases remains in force, yet deposit of carbon does not take place, simply because the temperature is not sufficiently high to decompose into their elements the volatile hydrocarbons present.

There is also carbon deposited in gas-retorts, where no diffusion to the external surface of the retort can possibly take place; for instance, in Mr. Malam's patent process, where the incandescant coke employed, through which the gases pass, soon becomes bound together into a solid mass from deposited carbon, unless it is kept broken up from time to time.

I also remember, when a boy, my father manufacturing carbon plates for electrical purposes, by moulding ground carbon, and subjecting the cakes so moulded to the action of the products of distillation from the coal inside the retort, so that the carbon deposited on and in them might further bind and strengthen them; and I remember well the beautiful silvery coat of carbon they received, and how strong they became.

Now, although I do not think diffusion or dialysis of the gases through or by means of the porous clay retort is the cause of carbon deposit, I do not wish it to be inferred that I deny that hydrogen is diffused through the pores of the clay. I am perfectly satisfied that, to a limited extent, such is the case; but I believe it is principally *after*, and not before its separation from combination with the other element, carbon, and never to anything like the extent of the increased quantity of gas obtained by the use of an exhauster.

I have further to remark, to supply an omission made by Mr. T., as previously stated, that I believe that not only does the hydrogen pass out, but that the same law of diffusion causes a certain quantity of the products of combustion from the furnace to pass *into* the retort. Indeed, were Mr. T.'s views in reference to the dialysis of gases correct, a considerable working pressure on the retorts would be an advantage, as were there no decomposition by high heats, the hydrogen by passing through the porous clay of the retort would be reduced, and leave the remaining gas richer in illuminants, and with a greater gross sperm value. The pressure would also prevent the infusion of the products of combustion from the furnace, which would, if admitted, reduce the illuminating power. That the diffusion of gases through the porous clay of a retort may to a very slight extent modify the amount of the carbon deposit, and the quantity of gas produced per ton, I am quite prepared to admit; but I am sure, if Mr. T. will again consider the matter, he will see that something else must be the primary cause of the deposit. If the porcelain disc of the instrument he describes were covered with a thin film of glass, or its pores closed with a little shellac or grease, its action on the atomolysis of the gases would cease. Now, gas-retorts are not long in their places, and subjected to a high temperature till their outer surface is covered with a layer of glass which almost puts a stop to this action, and therefore it can only be through the cracks or fissures in the retort filled with deposited carbon that this atomolysis can take place, and even then the carbon becomes so dense that its action is almost suspended.

In reference to the action of pressure on the destructive distillation of coal, Mr. Tysoe remarks that the effective pressure inside the retort, which influences the deposition of carbon, is that amount by which the whole pressure exceeds that of the atmosphere. Now, I think he might with equal consistency assert that the effective pressure within a steam boiler, which influences the temperature at which the water boils, is that amount by which the whole pressure exceeds the pressure due to the atmosphere. Every one knows that such is not the case; but that the change of the atmospheric pressure influences the temperature, and that when the pressure of the atmosphere is removed, water boils in the very act of freezing instead of at 212° Fahr. In a similar way, there is no doubt that the nature of the destructive distillation of coal will also be modified by variations of pressure, either atmospheric or artificially produced. I think, therefore, that his condemnations of Mr. Dunlop's views are, to say the least of it, premature, for he himself admits that the diffusion, or, as he puts it, the dialysis of gases does not follow the same law as that of their transpiration, but acts against considerable pressure.

Clippens Shale Oil Works, Paisley, Dec. 16, 1875. WM. YOUNG.

BIRMINGHAM GAS COMPANY.—An extraordinary general meeting of shareholders was held, on Tuesday last, to confirm a resolution already passed for winding up the concern. Mr. J. T. Collins occupied the chair, and moved—"That the resolution passed at the extraordinary general meeting of the members of this company, held at this place on the Dec. 6, 1875, 'That the Birmingham Gaslight and Coke Company, Limited, be wound up voluntarily, under the Companies Act, 1862,' be and is hereby confirmed." The motion was seconded by Captain Bullock, and carried unanimously. A resolution was then passed appointing the directors as the liquidators for the above purpose, and it was also resolved—"That the very cordial thanks of the shareholders be and are hereby tendered to the directors for the great zeal and ability they have manifested in the conduct of the affairs of the company since they took office, and that the question of their remuneration as liquidators be postponed until the final account is ready to be made up, and that then a meeting be held to consider in what way their services, both as directors and liquidators, shall be recognized." The chairman, in acknowledging the vote, referred to the defalcations of the late secretary, and said that the board on the 11th ult. passed the following resolution:—"That out of the amount remaining in capital account, the sum of £100 be invested in the names of the chairman and deputy-chairman, and Mr. Everitt, for the purpose of paying the costs of the prosecution of Harrison, the late secretary, should he return—with the understanding that, in the event of Harrison's death, or the occurrence of any circumstances, which, in the opinion of the trustees, would render it unnecessary to retain the fund in hand, the amount be divided at the discretion of the trustees amongst any of the charities of the town." He invited the shareholders to signify whether they approved of the resolution. An unanimous approval was given. It was further resolved—"That this meeting desires to express its sense of the fidelity and ability with which the secretary, Mr. Joseph Slocombe, and the engineer, Mr. Charles Hunt, have discharged their several duties."

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

FRIDAY, DEC. 17.

(*Before Vice-Chancellor* BACON.)

PATTERSON *v.* THE GASLIGHT AND COKE COMPANY.

At the sitting of the court this morning,

Mr. KAY said the evidence in this case had been read, and he now proposed to cross-examine the defendants witnesses.

Mr. ASTON said as in this case there would certainly be a conflict of evidence, especially as to memory of dates and circumstances under which certain things were done, he should ask that all the witnesses, except the one under examination, be requested to retire from the court.

Sir HENRY JAMES protested against such a course, and said it was only adopted in cases in which it was suspected that the witnesses would commit perjury. In all his experience he had never made such an application, or known it to be made, except on that ground.

After some conversation on the point, the witnesses were directed to withdraw.

Dr. W. Odling, cross-examined by Mr. KAY.

I have carefully studied, and for the last 20 years have been frequently consulted in reference to the manufacture and purification of coal gas. I was one of the three commissioners appointed by the Board of Trade to revise the price of gas in London in 1873 and 1874. I have been frequently consulted by gas companies in order to report upon the impurities in gas. I visited the Beckton works several times in 1872. I do not remember being consulted in the year 1871 by them or any other company; but at other times I have been consulted by the Imperial, the Phœnix, the South Metropolitan, the Dover, the Bursalem, and various other companies. I am quite familiar with all the ordinary operations for the purification of gas. I delivered a lecture on the purification of coal gas from sulphide of carbon on June 11, 1872, before the members of the British Association of Gas Managers (reported in "J. G. L.," Aug. 13, 1872).

Let me read these words to you, and I beg of you to follow me while I read them:—"If you take ordinary coal gas, and pass it slowly through an ordinary alcoholic solution of caustic potash, you will find the gas to be deprived, in great measure, of its sulphur and xanthate of potassium to be formed in the liquid. And the formation of xanthate of potassium under these circumstances will be another evidence to you of the existence of the sulphur contained in the original gas in the form of disulphide of carbon. But in practice we cannot, of course, resort to alcoholic potash as a purifying agent, but must content ourselves with sulphydrated ammonia or sulphydrated lime—that is to say, with gas liquor or foul lime in a particular condition—and having been consulted by certain gas companies to help them out of the difficulty they were in with regard to the large proportion of disulphide of carbon which continued to exist in their gas, despite every attempt to effect its reduction, my attention has of late been especially directed to the subject of sulphur purification." Do not you there refer to the reference made to you on behalf of the defendant company?—And on behalf of another.

But you do refer to the reference made to you by the defendant company?—Yes, certainly.

In the beginning of the year 1872?—Yes.

I suppose I may take it that disulphide of carbon and bisulphide of carbon mean the same thing?—They mean the same thing.

"My attention has of late been especially directed to the subject of sulphur purification, and I believe I am now in a position to point out to you the proper mode of using the agents of which I have just spoken, so as to produce a uniformly beneficial result"?—Yes.

"You are aware that trials and experiments out of number, and in ways the most various, have been made in the use of lime and gas liquor to effect the desulphuration of gas; and that, although at times and places some of these trials have led temporarily to most satisfactory results, they have not resulted in the introduction of any definite method of procedure which could be constantly and everywhere relied upon. Now, the essence of the method which I was led to suggest, and which has furnished excellent results in practice, consists in treating the gas for its disulphide of carbon in a distinct set of purifiers charged with sulphuretted lime, carefully maintained in the sulphydrated state by the previous removal of all carbonic acid from the gas in an initial set of clean lime purifiers, and supplemented by a subsequent removal of sulphuretted hydrogen from the gas in a final set of oxide purifiers. The recommendation agrees in substance with that of the gas referees, than which, however, it goes a little farther." Your reference there, I suppose, is to the report of the gas referees on Beckton purification?—Yes.

"It was made, however, without knowledge of the results and conclusions of the referees, and, indeed, a few days before the publication of their very able and complete report." Then you go on to say this: "In unpurified coal gas there are three substances of an acidulous character present—namely, carbonic acid, sulphuretted hydrogen, and sulphide of carbon. Of these three, carbonic acid, though, indeed, but a weak acid, is alike the most strongly acidulous and the most abundant. If, then, you pass your gas over slaked lime or through caustic ammonia, so long as the alkali is in considerable excess, it will absorb, not only the carbonic acid but also sulphuretted hydrogen, and jointly therewith some disulphide of carbon. But this last action, partial at the best, soon becomes insignificant. To effect, by means of alkali, the continuous removal of the least chemically active and least abundant of the acid impurities, you must take away the most active and abundant of them first. You must make the complete removal of the carbonic acid from your gas an object of primary importance, and effect its removal as a separate operation; not so much because of any objection to its retention in the gas delivered, as because of its non-removal interfering with the efficient removal of the sulphide of carbon. The process of purification, then, which I was led to recommend to those who consulted me, and which I now recommend to you, consists of three operations." Then you give them: "First, the gas from the scrubbers should first be purified completely from carbonic acid by being passed continuously through three out of four lime purifiers in the usual manner, putting the fourth purifier into the series, and throwing out the first purifier whenever the gas from the outlet of the second purifier produces a decided effect on lime water." That would be when it shows carbonic acid?—Yes. Sulphuretted hydrogen would not produce that effect on the lime water.

Then I may take it from you that this recommendation of yours is in the first instance to purify gas from carbonic acid, and to remove the purifiers when the gas coming from them shows carbonic acid?—Yes.

"Secondly, the completely decarbonated gas should next be treated with a view to remove from it its sulphur—not in the form of sulphuretted hydrogen. With this view it should be passed through another set of purifiers charged with lime that is left unchanged for weeks, and even months together—the hydrated lime in these purifiers"?—That is the substance often spoken of as sulphide of calcium. It is a sulphydrate; sulphide of hydrogen, if you like. It is essential to this second process that the gas should be completely decarbonated.

"The hydrated lime in these purifiers, by its union with the remaining sulphuretted hydrogen of the decarbonated gas will quickly become converted into sulpaydrated lime, and will remain in that form of this compound for an indefinite period, provided only that the gas passed over it is first completely and continuously decarbonated." That is the essence of the whole thing?—Yes, that is the essence of the whole thing.

"Notwithstanding the small actual quantity of impurity to be removed by these purifiers, they should be of full size, so as to allow time for the somewhat sluggish action between the sulphide of carbon and sulphydrated lime to take place in them?—Yes.

Then the third thing you recommend is that "the gas having been completely freed from carbonic acid, and treated for the removal of sulphide of carbon by being transmitted through sulphydrated lime, as above described, should finally be freed from sulphuretted hydrogen by being passed through three out of four oxide of iron purifiers in the usual manner." Is not that because the operation in the purifiers containing sulphide of calcium would be to free a little sulphuretted hydrogen again?—Or to leave a little sulphuretted hydrogen in the gas.

That would pass off and be taken up by the oxide of iron purifiers?—Yes, or by some fresh lime. It only mentions oxide of iron there.

Cross-examination continued: I spoke of this in my lecture as being a method which had furnished excellent results in practice. I do not know of any better method of getting rid of the sulpho-carbons practically. I received a letter from Mr. Phillips on the 19th of February, 1872, stating that the returns by the official testers, of the impurities in the gas, were causing great uneasiness, as all the efforts of the company to get rid of them were unavailing. In consequence of that letter, I went and inspected the Beckton works in February and also in March. On one occasion, Mr. Trewby described to me the operation as carried out there, although I cannot call to mind exactly the operation as then told me. Mr. Trewby gave me an account of the whole of the variations in the method of lime purifying which he had adopted; but whatever process was in use it was not successful. On the 28th of March, I wrote to Mr. Phillips that I found some difficulty in reporting upon the subject, on account of the small amount of positive knowledge which existed upon the subject, and of the means capable of removing sulphur from gas. I recommended a plan to be tried, but did not know whether it would succeed. The essential thing to be done was first to completely take out the carbonic acid. It is impossible to pass gas through lime without forming sulphide of calcium. If crude gas containing three volumes of carbonic acid and one of sulphuretted hydrogen are passed into a purifier of slack lime, the lime will absorb the sulphuretted hydrogen and the carbonic acid, though perhaps not in equal proportions, because carbonic acid is more readily absorbed than sulphuretted hydrogen. If gas were passed through up to the point of saturation, the effect would be that the lower trays would be wholly carbonate of lime. The top layer would be substantially pure sulphide of calcium, and the lower one in the same sense would be carbonate of lime. The point of saturation is where sulphuretted hydrogen begins to come off. I believe that in about 48 hours sulphuretted hydrogen would begin to come over; the carbonic acid by its greater affinity would drive out the sulphuretted hydrogen, and after that carbonic acid would begin to come over. I have no knowledge how long it would take for the carbonic acid to come off after the sulphuretted hydrogen had begun to come off at the Beckton works, but if it took 48 hours to set free sulphuretted hydrogen, I have no doubt it would take another 24 hours to set free carbonic acid. I know from the records kept at the Beckton works that lime was kept in the purifiers for more than a week after sulphuretted hydrogen was first shown, and before carbonic acid was shown. If I had not seen those tests I should have thought that carbonic acid would have shown 24 hours after sulphuretted hydrogen first appeared. I have read Mann's patent; there is no process described for taking out carbonic acid first, in the stage which leads to the formation of sulphide of calcium, but there is a provision for taking it out in a stage which refers to the use of sulphide of calcium. Mann's plan is simply to pass the crude gas through one purifier, and supposes it would turn all the lime in that purifier into sulphide of calcium, whereas it would only convert a portion of it into sulphide. The gas is then to be shut off from that purifier, and then passed into the oxide of iron purifier. Then the first purifier, which has become foul by the gas, is put after the oxide of iron purifier; but that, I think, is not such a good process as my own. The essential difference is that the purifier would not contain all pure sulphide of calcium; in my own process it would be substantially pure. Foul lime meant lime which has been subjected to the action of crude gas, and what Mr. Mann described would be really one stage of foul lime, as known to gas engineers. I have not been in the Bow works since 1868 or 1869, and cannot very well recollect what was done there. To the best of my knowledge the process was, that lime was used in the purifier before oxide of iron, and the lime, instead of being turned out when it began to show sulphuretted hydrogen, was kept in for a considerable time after it became foul, and only turned out when the amount of sulphur in the gas was getting too high. The principle carried on at Bow was the same as described in my lecture, although the order of carrying it out was different. The sulphur was in the manufactured gas after purification.

Re-examined by Sir H. JAMES: When I wrote the letter of the 28th of March I did not practically observe what was going on at Bow, but I had had frequent conversations with Mr. Harris, as to what was being done. My experiments were carried on more in the laboratory than at the gas-works. I went to Beckton in June to see the process in use, and on looking over the books I found, as a matter of fact, that gas did not show carbonic acid until seven or eight days after sulphuretted hydrogen first appeared. The practice differed from my expectations, which were founded on theory; but this is not an unusual thing in chemical matters, as practice often prevails against theory. I did not know of Mann's patent or the plaintiff's patent at the time I delivered my lecture. I have only seen Mann's patent since the commencement of the trial. Before the month of March, 1872, it was well known that sulphide of calcium, as existing in the substance, foul lime, had the property of taking out bisulphide of carbon. It had been used and was known to have been used. My lecture was to point out the principle of removing impurities from gas; but I now find that Mann's patent had forestalled me. My opinion is that having two separate series of purifiers is an advantage. If an engineer had worked four purifiers, the first two for carbonic acid, and the other two for sulphur, and changed the first two when they showed carbonic acid, that would have been doing what I recommended in my lecture.

Mr. F. J. Evans, cross-examined by Mr. ASTON.

I am a director of the Chartered Company, and have had more than 40 years experience in gas. Since the Bow works were taken over by that company, I have been acquainted with the process as carried on there; I have not inspected the operations personally, but have received reports on the subject, and have heard from Mr. Harris what was going on. I have not the daily records referred to in the report of the gas referees, but from the statement there set out I am able to ascertain how long the purifiers were kept in operation. Assuming that there were three purifiers at work at Bow, one resting and two in operation, I should not be able from the table to ascertain what was the state of each purifier when it was thrown out of action, without knowing the state of the gas going in. Assuming the average time during which each purifier was at work to be 176 hours; assuming that the crude gas contained three volumes of carbonic acid to one of sulphuretted hydrogen, at the end of 48 hours sulphuretted hydrogen would come over; after 96 hours carbonic acid might come over, but then gas would be impure. It would be foul from the sulphuretted hydrogen, and therefore it ought to stop long before that period arrived. The man in charge could tell by his test paper when sulphuretted hydrogen was coming over, and he would then stop. Assuming the lime purifiers were kept in operation for 176 hours, the gas would be foul, but I do not admit that the gas was ever foul. There must have been something wrong with the works at Bow if the gas contained from 38 to 57 grains of sulphur per 100 feet. At Bow the sulphur was generally lower than at the other works. They do not have the fluctuations in per centages now which they used to have; the fluctuations are always under

the maximum fixed by the gas referees. I always objected to fixing a maximum per centage of impurity at all. I certainly objected to its being fixed as low as 30 grains. I was not a referee in 1872, but as a director of the company I still objected then. My objection exists at the present time. The maximum is 15 grains in the summer, and 20 in the winter, and at Beckton we keep within that. The company are not called upon to pay penalties now for infringing the maximum as they are below the average. Testings for carbonic acid are frequently employed at Beckton, but I cannot say how often. I have seen and taken myself testings for carbonic acid at the company's works at Westminster, between 1850 and 1865, when we were using oxide of iron. The main object in purifying gas by lime, is to take out the sulphuretted hydrogen; in testing for sulphuretted hydrogen we indirectly test for carbonic acid. The lime system is used in almost every country gas-works. We do not use lime when the oxide of iron process is employed. There was no test for carbonic acid until after the spring of 1872, except in the sense in which he applied it, but I believe the carbonic acid test is now applied to the first and second purifier. That was begun in 1872. The object of the check purifiers is to insure the gas from any impurity through a leaky valve or anything of the sort. The action of the check purifier takes place after gas has been purified, by whatever process is in use. Mr. Patterson never mentioned to me prior to 1872, that he had taken out his patent. If he had done so, I should pretty quickly have told him what I thought of him. I never had any conversation with him about it. With regard to the pressure of the gas distorting the purifiers, I may say, that the purifiers in the first house are of wrought iron, carried on a timber framing, supported by a series of little brackets. Before that, the pressure produced by the gas was so great as to have the effect of depressing the bottom of the purifier, causing a sort of hollow, and allowing the gas to go through. The wrought iron plates of the purifier are ¼ inch thick, and the diameter of the purifier 25 feet, so that the pressure per square inch would be about 1½ lb. The supports were not strong enough to stand the pressure; the timber supports were 12 inches square. The beams are supported on cast iron columns at intervals of 12 feet. The sagging of the plates would be in the centre and not at the sides. The sinking would not cause the sides of the purifier to jam hard against the edges of the trays. There would be a stretching as well as a sinking of the ¼ inch iron plates. The sides of the purifier were not materially altered by this sinking, but the position of the lime would be altered. I wrote a letter on the 23rd of January, 1873, to the assistant-secretary of the Railway Department of the Board of Trade, stating that the company had applied to Drs. Letheby and Odling, that they had visited the works on independent occasions, and were shown the process of lime purification then in operation, which was practically the same as that now in use, and they specially observed and remarked on the action of the carbonic acid purifiers. I used the words, "especially observed and remarked on the action of the carbonic acid purifiers," as that was my impression of what they stated in their reports. I did not go with Dr. Odling to the works, but I went with Dr. Letheby on the 11th of March, 1872, and Dr. Letheby thought we were taking out too much ammonia, and suggested that the purifiers for taking out carbonic acid should be changed earlier, and before they showed carbonic acid.

Will you tell me the very earliest moment at which you saw the carbonic acid test applied with your own eyes?—I do not think I have ever seen it.

Re-examined by Sir H. JAMES: There are circumstances which at times cause greater impurities than at others. The principal cause is the kind of coal used. The temperature also affects the purity of the gas, but to what extent I cannot say. The variation from 35 to 53 grains is very exceptional; the average is about 14 grains. We indirectly test for carbonic acid while testing for sulphuretted hydrogen when lime is used. If sulphuretted hydrogen is not coming off, the carbonic acid has been abstracted, as the carbonic acid had a greater affinity for lime than sulphuretted hydrogen. If the purifiers were distorted the gas would not pass over the lime. The distortion arose from the supports in the centre being insufficient; this defect was afterwards remedied. I was present when Dr. Letheby visited the works on the 11th of March, but not when Dr. Odling visited them. At that time I knew nothing of the plaintiff's specification, and Mr. Patterson had never told me of his invention. Dr. Letheby could see what was going on at the works. What was then going on was practically the same as that which was in use when I wrote the letter of the 23rd of June, 1873. I had seen Dr. Odling's report before I wrote it, and there I found reference to the "completely decarbonated gas."

Dr. *Letheby*, cross-examined by Mr. KAY.

I read a paper before the Gas Managers Association at Birmingham on the 31st of May, 1865, which, as far as I can remember, was accurately reported in the JOURNAL OF GAS LIGHTING. The lecture was upon the then condition of gas lighting. In that lecture I stated that the constituents of raw gas were tarry matter, aqueous vapour, carbonic acid, ammonia, cyanogen, sulphocyanogen, sulphuretted hydrogen, bisulphide of carbon, sulphohydrocarbons, nitrogen, oxygen, hydrogen, light carburetted hydrogen, carbonic oxide, and condensable hydrocarbons. At that time the most difficult to get rid of were the sulphocarbon. All of these, omitting the hydrogen, light carburetted hydrogen, carbonic oxide, and condensable hydrocarbons, may be considered as impurities. I pointed out that the perfect removal of these impurities involved a proper order of purification, and both science and practice pointed to the fact that the condensation or cooling of the gas should not be too sudden, and the longer the gas was kept in contact with tar and ammoniacal liquor before it went to the condensers the better. It had been seen in numerous instances that a long hydraulic main, extending a considerable distance from the retorts, always affected the condensation of naphthaline, as well as objectionable sulphur compounds; and when gas had traversed the condensers, it was never properly purified if it left them at a higher temperature than 60° Fahr. The aim, in fact, should be slow but complete condensation by gradual cooling; for if the temperature of the gas exceeded 60°, the ammoniacal liquor was never of its full strength, and much sulphur, ammonia, carbonic acid, and aqueous vapour passed on to the purifiers, where such impurities were seriously in the way. The next question was how to remove from the gas the sulphuretted hydrogen, the ammonia, and the other impurities which still remained. In continuation of the system already adverted to, it was well to submit the gas to the action of a copious stream of ammoniacal liquor after it left the purifiers. Then, after referring to certain processes, the lecture went on:—"The residual impurities—namely, the ammonia, sulphuretted hydrogen, and carbonic acid are next to be removed in proper form. Washing the gas with water, or with weak ammoniacal liquor, and finally with water, will at once abstract a considerable amount of all these impurities, and although there is a prejudice with some engineers that this kind of purification is objectionable on account of its lowering the illuminating power of gas, yet, as we shall see hereafter, the prejudice is not founded on fact, except that the process undoubtedly removes such compounds as tar and naphthaline, which, though of high illuminating power, are, nevertheless, better out of the gas than in it, seeing how much mischief they do by subsequent deposition in the mains and service-pipes. You will have an opportunity of seeing at the Saltley station of the Birmingham and Staffordshire Gas Company, in this town, the good effect of thoroughly washing the gas with water or weak ammoniacal liquor before it passes to the purifiers. The order then of purification is—1st, slow, but complete cooling; 2nd, washing with ammoniacal liquor; 3rd, the removal of ammonia by water or acid; 4th, the abstraction of sulphuretted hydrogen by lime or oxide of iron; and 5th, carbonic acid." That lecture had reference to the purification of gas by oxide of iron, and was not for the purpose of pointing out any difference between lime and oxide of iron. My experiments had led me to the conclusion that 1 per cent. of carbonic acid incommon coal gas would diminish the gas about 5 per cent.; it was, therefore, a serious impurity, and should be removed from gas. This is easily accomplished, for carbonic acid is soluble to common temperature in its own volume of water, and alkalies absorb it freely. Caustic lime would take up nearly its own weight of the gas, and the purification should always be so managed that lime was the best agent through which the gas passed on its way to the holders. In 1870 I read a payer at the meeting of the Association of Gas Managers, in which I described the process in use at the Bow works. I stated that the ammonia was removed from the gas by a series of three large scrubbers, the first two being charged with a stream of ammoniacal liquor, and the third with water. The gas was then passed through a series of dry lime purifiers, which presented a very large surface for absorption, and the lime was purposely left in the purifiers after it became foul, and until a good deal of the sulphuretted hydrogen first absorbed was dispensed by carbonic acid. In this manner the natural affinity of sulphide of calcium for bisulphide of carbon was permitted to act, and much sulphur in this objectionable form was retained. Leaving the lime purifiers, the gas, still charged with more or less of sulphuretted hydrogen, was passed through oxide of iron. In my lecture I recommended the lime should be kept for a considerable time after it became foul, and I should still recommend the same. If it was necessary to use oxide of iron, on account of the difficulty of disposing of foul lime, it should be used after the lime. That was solely to take out the sulphuretted hydrogen. I have frequently visited the works at Bow as a referee, but not to advise. In 1871, as now, they employed two lime purifiers, and then the oxide of iron purifier. The test in use was a sulphur apparatus at the end of the second purifier; as soon as that showed the sulphur to be rising, the first purifier was shut off. There were three lime purifiers in a series. Foul gas was made to pass into the first, then into the second, and then into another, which could be put on at any moment when the sulphur appeared. Between the second and the oxide of iron purifier a test experiment for sulphur was put on; and, as soon as the sulphur was found to be rising, they knew that the sulphide of calcium had done as much as it could for taking out bisulphide of carbon. They put on another clean lime purifier. No test for carbonic acid was ever used at the outlet at Bow. On the 18th of March, when I reported to Mr. Phillips, the test in use at Bow for determining the quantity of sulphur was by burning the gas, and a simple oxide of iron purifier was used for taking out sulphuretted hydrogen. The test would not distinguish how much of the sulphur was in the form of sulphuretted hydrogen, or in any other form. They do not take out the sulphuretted hydrogen from the whole of the gas, but only from the portion they are testing. I was invited by Mr. Phillips to inspect the Beckton works, to see if I could help them; and although I demurred at first, in consequence of my official position, I did go, however, and reported upon the subject. [The report has already appeared in a previous part of the case.] Carbonic acid tests were employed at that time. The purifiers were kept at work four days after carbonic acid came over, and the effect of that upon the lime in the first purifier would be to convert it into carbonate of lime; it would contain little or no sulphur. If the purifier were filled with slaked lime, the gas would take up all the carbonic acid, and at first the sulphuretted hydrogen; and when it had taken up as much as it could, the sulphuretted hydrogen would first come over, but I cannot say how long it would be before the sulphuretted hydrogen first begins to appear, as it is dependent upon so many circumstances. If Mr. Trewby has stated that the first purifier showed sulphuretted hydrogen from 12 to 24 hours after being set to work, it might be so. Supposing there were three volumes of carbonic acid to one of sulphuretted hydrogen, and that it took 24 hours before sulphuretted hydrogen came over, I should say it would take about three times that time before the sulphuretted hydrogen would be displaced in the purifier, so as form sulphide of calcium. Carbonic acid has a greater affinity for lime than sulphuretted hydrogen has. Taking the volumes as three to one, I cannot say what proportions of the two would be taken up by the lime at the moment sulphuretted hydrogen begins to come forward. I can only answer practical facts, not theoretical, and the proposition put forward by counsel is not a sound one. Carbonate of lime predominates in the lower trays of the purifier, and sulphuretted hydrogen in the upper ones, and pure sulphide of calcium in every part. In theory I agree that the purifier ought to show carbonic acid in a third longer time after it shows sulphuretted hydrogen, upon the assumption of three to one, but in practice it does not. Sulphuretted hydrogen comes over before carbonic acid, and then carbonic acid, mixed with sulphuretted hydrogen. The average time for the carbonic acid to show, after the sulphuretted hydrogen comes off, is from 12 to 24 hours. Speaking theoretically it would take, perhaps, from 24 to 36 hours to drive off the sulphur compounds. When lime is in the condition of carbonate of lime, it has not much purifying influence on gas. It has no purifying action on bisulphide of carbon, but hydrated carbonate of lime does take up a large quantity of sulphuretted hydrogen. There is no better agent than sulphide of calcium for taking out the bisulphide of carbon. It is not important in what condition the gas is presented to the action of the sulphide of calcium. So long as there is sulphide of calcium present in the purifier, whether the gas contains one, two, or three times its volume of carbonic acid—so long as the sulphide of calcium is capable of combining with bisulphide of carbon, it will combine. For a time it will act on the sulphur compounds, but afterwards it becomes inert as carbonate of lime. It is very important to ascertain what is the relation of the purifier to the gas when the gas goes to the purifier. No doubt if gas which has no carbonic acid in it, and no sulphuretted hydrogen, but only sulphocarbon, is submitted to the action of sulphide of calcium, the sulphur compounds will be better and more effectually removed than if the carbonic acid still remained in it. They want to use it in such a way as only to take out the bisulphide of carbon; that is the proper thing to do; but if you want the sulphide of calcium to take up all the impurities, it is a matter of no consequence whether the sulphide of calcium is put into the first, second, or third purifier, provided you do not put it in such a position as that your carbonic acid undoes what you have done before. The sulphide of calcium will be operative to take out sulphocarbon as long as there are protosulphides to combine—perhaps for a month. I have never tested the gas at Beckton, and have no knowledge of the proportions of carbonic acid and sulphuretted hydrogen in it; but I suppose it is like all other gas manufactured from Newcastle coal.

Re-examined by Sir H. JAMES: The proper proportion of carbonic acid and sulphuretted hydrogen in gas in its crude state is, in my opinion, one of carbonic acid and three of sulphuretted hydrogen after it has left the scrubbers. The lecture in Birmingham was written in relation to the use of oxide of iron, and taking out carbonic acid by means of lime. At Beckton the test was placed between the two vessels for carbonic acid and the two for sulphur. Testing for sulphuretted hydrogen gives a test for carbonic acid, because sulphuretted hydrogen precedes carbonic acid; and in the old-fashioned way of working they never tested for it, because they knew sulphuretted hydrogen came before it.

SATURDAY, DEC. 18.

Mr. *William Mann*, cross-examined by Mr. FRY.

I took out a patent with regard to gas purification, and presented my petition for that on the 2nd of December, 1871. I filed my complete specification in June 1872. The subject of my patent was, in my opinion, at that time novel. It is public property now. I do not know the date of its becoming void. I did not make the third annual payment of £50. I have never received any royalty under that patent, or granted any licences under it, or brought any action or suit under it. I recollect the appointment of the gas referees; I have from time to time seen them, and co-operated with them, especially on the subject of purification

from bisulphide of carbon. I recollect two meetings which took place between the referees and the gas engineers of London. I did not propose a plan by which the sulphur question could be solved. I saw the report of the gas referees with regard to the Beckton works, I presume shortly after it was made public. In March, 1872, I was in the employment of the defendant company. I never suggested to the referees that the plan pointed out in that report was an infringement of my letters patent. I recollect writing to the secretary of the referees on Feb. 1, 1872, a letter showing the temperature of the inlet of the scrubbers for the last month, and saying: "I have never tested for carbonic acid, nor at present have I the means." That was correct, as I then understood it. We have always the means on any gas-works of testing for carbonic acid, because where we can test for sulphuretted hydrogen we can test for carbonic acid. There have been hundreds of tests taken for carbonic acid, both at the inlet and the outlet. I had tested for carbonic acid hundreds of times before the 1st of February, 1872. We used oxide of iron. The test we used when we used oxide of iron was for sulphuretted hydrogen, but for many years we used the dry lime process, and we used a coal that produced more carbonic acid than any coal known—namely, Ramsey's cannel. In 1872 I was using the oxide of iron process. We gave up the dry lime process when we left off using cannel coal. That was some time after the amalgamation which took place in 1870. From 1870 to 1872 we used the oxide of iron process only, and during that time we had tested for sulphuretted hydrogen, but not for carbonic acid directly, except upon the cannel gas apparatus; that was separate from the other. That was not after the gas had left the last purifier, it was after it had left the first, at the second purifier. In February, 1872, we were not making, from time to time, tests for carbonic acid between the first and second purifiers. I cannot tell when we ceased, but it was when we ceased to make cannel coal gas. For a short time after 1870 down to 1872 we never tested for carbonic acid. It was not usual to test for carbonic acid in common coal gas, because the presence of a small quantity of carbonic acid was not considered material. The only case in which we habitually tested for carbonic acid was in the cannel coal manufacture, which had ceased shortly after 1870. In February, 1872, I had never tested for carbonic acid at the inlet of the scrubbers, even when we were making cannel gas. We had the means at that time of doing so I can test at the inlet of the scrubber for sulphuretted hydrogen, and can test there for carbonic acid too. When I said I had not the means, I understood it was for the volume that was in our gas. All the information of the gas referees was always with reference to the volume of impurities present, and not the fact of its being there. It would require two or three days to get an apparatus for an experiment of that sort, whereas you can always go with lime water and get a test. I know Mr. James Clark and Mr. Kirkham, connected with the Imperial Gas Company. I do not remember their calling upon me in May or June, 1872. If Mr. Clark or Mr. Kirkham say they called, I should not doubt it. I should certainly say that I had not then the means of keeping down the sulphur impurities to 20 grains, because I had to use any coal that was sent me. I had no power of selection. When I was an officer of the City of London Gas Company, I could keep the gas down pretty nearly to 20 by selecting the coal and only using oxide of iron. I believed at that time that if I had the means of using my own process I could purify the gas as well as it is purified in the best condition now. In May, 1872, I could not keep the sulphur down to 30 grains except by selecting the coal. I knew lime would do it, but could not use lime in the heart of the City in consequence of the nuisance which would be created by lime being exposed. It is created when lime is in the condition of sulphide, not in the condition of carbonate.

Re-examined by Mr. SOUTHGATE: I had not in May, 1872, given up faith in my invention. Messrs. Kirkham and Clark did not come to me in such a way as to ask me for information how to purify gas. Whatever took place in May, 1872, had not reference to lime. My reason for not continuing my patent was, that seeing that the thing was in litigation, and also understanding that they were accoplishing what I was aiming at at Bow Common, and the reason of the gentleman who was with me in the matter, and who would have taken the matter up, was that it was considered there was no use in spending any money upon it. I had occasion to meet the referees after their report of Jan. 31, 1872, issued in March. I recollect no conversation with them as to what is called their sulphur process. I had not made any test for carbonic acid at the inlet of my purifier in a business way. I have made a test there merely to ascertain the presence of carbonic acid, but not as a part of the routine of the purification of coal gas. I felt I had not the means then of ascertaining the volume, but with a solution of lime you can go and test for carbonic acid at any point where there is a tap. Anybody with lime water can find out whether there is carbonic acid in gas.

Mr. *Thomas N. Kirkham*, cross-examined by Mr. FRY.

In May, 1872, I was one of the officers of the Imperial Gaslight and Coke Company, and recollect receiving instructions to go with Mr. Clark to visit the works of the Chartered Gas Company at Blackfriars, and the South Metropolitan Gas Company at the Kent Road, to consult the engineers of those stations with reference to the mode of purification for sulphur compounds. I went to Blackfriars, but am not certain whether I saw Mr. Mann. I recollect writing a report to my directors in conjunction wtth Mr. Clark, and I believe what was stated in that report to be a correct statement to the effect that Mr. Mann said he could not keep the sulphur impurities down to 30 grains.

Mr. *George C. Trewby*, cross-examined by Mr. KAY.

I am manager of the Beckton Gas-Works, and have been so since the opening of the works in 1870. I remember communicating with the gas referees, Mr. Patterson, Mr. Pierce, and others. Those communications extended from 1871 to 1872; they were very numerous. I always gave the referees all the information in my power. I have performed any experiments they asked for, and told them everything we were doing. There was nothing done by way of purification which was kept back from them. In 1871 certain changes were made at Beckton in the purification process. I know Dr. Letheby and Dr. Odling. I think Dr. Odling stands very high. If I wanted to consult a chemist, I think I should consult Dr. Odling. I have a high opinion of Dr. Letheby; I think they know as much of the science and practice of gas purification as any chemist, so far as my knowledge goes. I do not know of any chemist who knows more than they do. I remember Dr. Letheby being invited to go down, in the early part of 1872, to Beckton. I was not cognizant of the letter that was written, before it was sent. I only saw it when it appeared in print. I first heard of Dr. Letheby being sent for through Mr. Patterson. I think he suggested that he should be sent for. Mr. Patterson was one of the referees, and I understood it was at the suggestion of the referees. I did not know the object of sending for Dr. Letheby, but I have no doubt it was to get information from him as to the purification of gas. Mr. Patterson asked me not to give him any information about carbonic acid. We had not reduced the amount of sulphur at that time, and our efforts to effect an alteration to that time had been baffled, because we had not been able to get all our purifying apparatus at work. If I had been asked at the time, I should have said, "As soon as I get my purifying apparatus in action I can do it." In the previous October we had reduced the amount of sulphur compounds, but not by way of continuous process at that time. Neither the secretary nor the directors had any conversation with me as to what we were doing at Beckton. I imagined the object of Dr. Letheby in going down was to suggest a means, if he could, for reducing the sulphur impurities. The works were imperfect at that time, because we had no condensers. We had been working down to 1872 without any condensers at all, beyond the length of pipe which went into the retort-house. That was treated as such, but it was not so practically; we drew off tar from that length of pipe. The pipe might have been 300 or 400 feet long, but it was buried under ground, so that really it was a non-conductor. Our scrubbers were out of order also. We could not properly use the third set of purifiers for want of the check purifiers. We had been working for a little more than 12 months, that is from the winter of 1870 to March, 1872. The works were planned by Mr. Evans, and are the largest gas-works in the world. I believe anything reasonable would have been done by the directors to ensure their completeness and efficiency. The purifiers were upon an unusually extensive scale. I explain the delay for a year and a half in rectifying the defects, by saying that it took two years to construct the works, and it was not until the middle of 1871 that I got permission to have the condensers put up. They were not brought into operation until the spring of 1872. I suggested that the defects should be removed about the beginning of 1871, to Mr. Evans. I told him it would be impossible for us to go on without condensers. He did not give his consent immediately. I do not think he said it was possible to do without. I believe it was simply an experiment in the first instance to work without condensers. He thought a long length of pipe would do as well. I told Mr. Evans that the scrubbers were not doing their proper amount of work; owing to the insecure foundation, the scrubbers were out of level; instead of being perfectly upright, they would be 6 or 7 inches out of level, and that led to a difficulty in getting the ammonia out. The ammonia is got out by copious washings with water. The gas would creep up some parts of the scrubbers without coming in contact with the scrubbing material. That was coke on which water was allowed to filter. Part of the coke in the scrubbers was dry. I did not go into all these details in my affidavit, because I did not see there was any occasion for it. The check purifiers are placed upon the inlet of the meter. The gas goes into the meter after it has been completely purified. The office of the check purifier is to arrest any trace of sulphuretted hydrogen or ammonia that may pass the other purifiers. Another name for them is catch purifiers. A mode in which the ammonia or sulphuretted hydrogen does get into the gas is when the valve is turned, or the valve may leak. We afterwards found out the sinking of the purifier; when the pressure came on the bottom of the purifier, the bottom plate sagged. I was not present when Dr. Letheby went down, and did not see him. I wrote him a letter of the 23rd of March, 1872, which was after he had been down. In that letter I did not refer to any of the defects I mentioned, because there was no occasion to do so. It was not my object to make public the defects. I did not designedly conceal them. Dr. Letheby saw everything. I did not want to write a long letter; it was simply a reply to some communication. If I had been asked to write a report upon what had taken place since the opening of the works, I should have done so. I wrote a letter to Mr. Phillips on the 19th of February, 1872, with respect to what was being done at Beckton in answer to a letter of the referees, dated the 8th, stating that the sulphur at Beckton continued to be excessive in quantity, and desiring to know whether the company had taken every possible means to keep down the amount of sulphur, and asking to have a full statement on the subject. In answer to that I wrote saying my attention had been given to gas purification, and numerous experiments had been made to elucidate the subject. My views had been communicated to the referees from time to time. I was invited to submit a full statement, to be sent to the referees, of the defects, and what had been done to remedy them, and when I wrote the letter I considered it was all comprehended in the statement about the completion of the purifying apparatus. In addition to that the referees knew from time to time what we were doing. I wrote on the 23rd of March direct to Dr. Letheby, at the request of Mr. Phillips, saying that from the time we commenced the use of lime we worked the purifiers in the same way as is done at Bow Common, and as is generally practised, working them in consecutive order. That was the mode in which lime purifiers were generally worked at that time. That reduced the sulphur to a certain extent; but our results were not what we could wish. The condensers were finished and put in operation, I think, in February. I think there is an entry in some book when the connexion was made; that would be our means of tracing it. I do not know whether the condensers were set to work before the 18th of February, but the condensers had nothing to do with trying the plan we were then adopting. The check purifiers were not in use then. I will not undertake to say whether we had the condensers before we began the new plan, but my belief is that it was after. The system was in use from the 18th of February to the 12th of May, and all that was necessary was to add the check purifiers. But our condensers were not perfect. What had been designed up to the 12th of May I believe was at work. I completed the new plan on the 18th of February, working four purifiers in a set, the first two being for carbonic acid, and the last two for sulphur, and my system was to change the first vessel as soon as it showed carbonic acid. With reference to the ordinary way of working, that was quite a new plan, but it was a repetition of what we had done in the previous October. Bearing in mind what we had done in the previous October, the statement that it was "quite a new plan of working the purifiers," was not quite true. I had not forgotten what had been done before. I had the record in my books. In reference to the first and second sets of purifiers it was a new plan, but the same thing had been done in the previous October, though in a different way. It was a new plan, keeping some of the purifiers for carbonic acid, and the others for sulphide. It was a new plan so far as I was aware. That new plan commenced in February, and did not succeed at first. It succeeded after we got all our purifiers at work, and rectified the defect of the sinking. We gradually got better and better by that plan. I am acquainted with the official testings of the gas examiner. [A book was handed to the witness.] I believe those are copies of the returns made by the tester.

Have you any reason to doubt that those testings are correct?

Sir H. JAMES objected that the original testings were not produced.

Cross-examination continued: What I represented as a new plan in my letter of the 23rd of March to Dr. Letheby was a new plan referring to the first and second sets of purifiers; that is all I mean by "quite a new plan." I had worked them before in consecutive order. I had not changed my purifier as I did on the 18th of February, previous to that time. In October, 1871, I had lime in the first purifier, and the third set in a state of sulphide. I did that by making changes in the first and second sets from time to time. All the carbonic acid was taken out by the first and second sets. I knew that from the state in which the lime came out. In the particular new plan I am not prepared to say whether we tested for carbonic acid, there was no necessity for it. What we did in October answered, and it would have answered after, if we had reduced our make of gas. We could not get our gas through it. It answered because it reduced the sulphur. What we did in October, 1871, was on a working scale, it was not by the suggestion of the referees, it was my own suggestion. In October, 1871, we reduced the sulphur carbon to 18 and 16 grains on two successive days, and I think it went on for some time. I think those were the only two days we could keep the purifiers at work continuously. From October, 1871, to the 18th of February, 1872, we never did anything of that kind again. After those two days the sulphur carbons are recorded in our books. We found that whenever we passed that gas through the purifier we reduced the amount of sulphur. It went on for two or three weeks, but only on two days we got it as low as 18 and 16 grains. The two days on which we did that were the 28th and 29th of October. On the 28th it was 18·94; on the 29th, 16·55; on the 30th, 27·58; on the 31st, 29·13; on November 1st, 40·28. The explanation of that is that the purifier was not kept at work the whole time. Whenever the pressure got up, the man threw it out. All the tests were not taken at the same place, but at different parts of the purifying-house. I can swear that the tests were taken at different places. Where there are two testings, the one refers to the inlet of the third set, and the other to the outlet of the house, and where there is only one it refers simply to the outlet of the house. The first purifier showed sulphuretted hydrogen about 24 hours after being put to work in March, 1872. If more gas passed through it would show sooner. We test now at Beckton for carbonic

acid after the first purifier. The average time in which that purifier shows carbonic acid after it has shown sulphuretted hydrogen depends on the quantity of gas. I took an average over one month, and I found it took nine times as long for the purifier to show carbonic acid as to show sulphuretted hydrogen. The least time in which it shows carbonic acid after showing sulphuretted hydrogen I have not examined, but it would probably be three or four times as long. We had an unusual amount of carbonic acid in our gas at Beckton. After the gas leaves the scrubbers the carbonic acid in the gas varies very much; sometimes 3 to 1, sometimes 2½ to 1, and sometimes only 2 to 1.

If the gas that comes from the retorts contains more sulphur, by reason of the nature of the coal, in one form, would it not contain more in all forms?—Not necessarily so. In practical working you may get more sulphur compounds and less sulphuretted hydrogen. I cannot fix the day in October, 1871, when I put the lime purifier first; but it is in the report of the referees; it was somewhere about the 23rd of October. I have seen the returns appended to the referees' report. I saw them after they were printed. I have never objected to them as being inaccurate. I do not remember whether I revised the tables appended to the referees report. On the 23rd of October we charged with lime the first purifier in the third set.

Re-examined by Sir H. JAMES: The gas-works at Beckton are very extensive, I believe the largest in the world. We first commenced to produce gas there for public use in the winter of 1870. We had great difficulty at first in getting the apparatus in order. The difficulty was principally in condensation. The gas entered the scrubbers at too high a temperature, and we had great difficulty in keeping our ammonia down, and the scrubbers were clogged with tar. I did not mention those defects in my letters to Mr. Phillips and Dr. Letheby, because they were known to the gas referees. Before the referees report was published I had given to the referees information in relation to the condition of the condensers and the scrubbers. The condensing apparatus was imperfect, and inadequate, and the defect in the condensing process was, I believe, its being buried. The gas entered the scrubbers at a higher temperature than was usual at gas-works. The effect would be that we should not extract the same amount of carbonic acid from the gas as we should if the gas had entered the scrubbers at a lower temperature. It is desirable to get out the carbonic acid. The high temperature has this effect, that you cannot get a strong liquor in your scrubbers, and you cannot get out the same amount of carbonic acid. Another defect was the sagging of the centre portion of one of the purifiers; I myself found it out. I first found it out in the beginning of 1872. In order to remedy that we had to take precautions in charging the purifiers, to prevent the gas from passing too readily. The effect of that was that it diminished the amount of lime brought into action. Some of the lime would not have the gas brought in contact with it, and some passed with all its impurities in it. When I wrote the letter to which my attention has been directed we were erecting the check purifiers, and improving the condensers. The difference between what we did in October, 1871, and what we did on the 18th of February, 1872, was that what I did in October I did in three sets of purifiers, and what I did in February was in two sets. I split a set into two. There was practically no difference. There are four purifiers in a set or series. On the 18th of February we worked two of the purifiers for carbonic acid. When I wrote my letter of March 23rd I did not know anything whatever of the contents of the plaintiff's provisional specification, and I did not know what was in it until six months afterwards. On the 18th of February the plaintiff had not told me he was going to take out a patent for that plan. In February, 1872, the check purifiers were not at work, nor were the condensers fully arranged as they are now. The check purifiers were put to work, I think, in May. We have only recently perfected the condensers; within this year we have added a little more condensing power. Our condensers came into operation in the beginning of 1872. The check purifiers are used for the purpose of arresting any escape of sulphuretted hydrogen or ammonia in shifting the valves. We did not get rid of so much impurity before the check purifiers were in order as afterwards. When the check purifiers were at work we continued to use two lime purifiers for carbonic acid, as we had used on the 18th of February.

Carrying that work into operation as you did on the 18th of February, 1872, and continuing it when you had your check purifiers at work; did you do that in consequence of anything you learned from the plaintiff or his patent?—No.

Was that entirely from your own experience and your own knowledge?—Yes. After the 28th and 29th of October, we came back to a higher rate of impurity because we were not able always to keep the first purifier in the third set at work. We could not work that, owing to the excess of pressure. We took that purifier out, and that lessened it. Two streams had to pass through the one purifier, and that added to the pressure tremendously. In February, 1872, the third set was charged with oxide of iron, it was charged with lime in May, and since then we have returned to oxide again. I am now working oxide in the third set. That which I was working on the 18th of February was seen by Dr. Letheby when he visited the works, and he could tell whether I am correct in that statement. I kept a record of the time it took for lime to absorb sulphuretted hydrogen and for carbonic acid.

By the VICE-CHANCELLOR: I was not present when Dr. Letheby came to the works. What was being done on the 18th of February was continued up to March. All the defects at Beckton had been pointed out to the referees before they asked for information.

TUESDAY, DEC. 21.

Mr. *Stephen Carpenter*, cross-examined by Mr. KAY.

I have been 24 years employed at the Bow works, and since 1866 or 1867 I have had charge of the purification of gas in all its stages. I remember the time when the gas referees fixed the maximum for sulphur impurity. I think it was about March, 1872. The maximum is now 20 grains in winter and 15 in summer, and we manage to keep within that. That is not a good deal lower than it was when the maximum was fixed. I think we kept it down in 1867, but I cannot say what was the average. Perhaps we were above the maximum in 1867, but we are never above it now. We can purify better now than we could in 1867, because we have more practical knowledge; but I do not obtain any better results now than I did in 1867. In 1869 I believe we were under the standard. I cannot remember from day to day. We have two condensers, but I cannot say how many pipes there are to each. There are four scrubbers. In those we have bricks, wood, and water. I suppose that is better than coke, but I leave that to the engineers. We have fresh water and ammoniacal liquor. Then it goes to the purifier with dry lime. I have two purifiers at work and one waiting. We change the lime purifiers according to the quantity of gas we are making. I have to make so many feet of gas go through so much lime. At the present time we are passing 3½ million cubic feet of gas through every purifier. Our purifiers are square. I do not know how much they are across, although I have seen them every day since 1867; they may be from 20 to 24 feet across. There are four trays in each, and the depth of lime on each tray is 4½ inches. We change the lime in the first purifier for every 3½ million cubic feet of gas—about every 30 hours at the present time. We know when to change the lime by having a test on each purifier. After the first purifier we have a test. We test with lime water for carbonic acid. Perhaps we test once a day, or once a week—it is mere curiosity. Between the first and second purifiers we use the sulphur test. We use that every day. If you apply acetate of lead paper, it will show when sulphuretted hydrogen comes over. Between the first and second purifiers we use the carbonic acid test sometimes, and the sulphur tests continually. We turn a tap, let a little gas come out, hold the paper, and when it blackens the paper it shows that sulphur in some form is coming off. I do not want to test, because I am quite aware that sulphuretted hydrogen is there. I change the first purifier after I pass 7 million feet. We change the lime in the first purifier about every third day. I said before, 30 hours—that was true; but I did not understand you referred to the first purifier. Of the three purifiers, we have two at work at once. When I fill a purifier with clean lime, I put it on as the first of the two. We put the clean lime in the first purifier of the series. We use that sometimes two days, and sometimes three, according to the quantity of gas we are making. We pass 7 million feet of gas through the first purifier without making a change. Then the second comes first, and the third one second. That is always the order. We put on a clean purifier in from one to three days. The test we apply after the second purifier is the new sulphur test, not Dr. Letheby's. I like the old sulphur test as well as the new. The sulphur test is a bottle; in it there are glass marbles, and when it gets to work there is condensation. The liquor formed inside has to be analyzed. According to that I can tell whether there is sulphur in the gas, and how much in a hundred cubic feet. I apply that sulphur test after the first and second purifiers. I also apply the acetate of lead test between the first and second; I do it out of curiosity. My great improvement in purification was in 1867. We have four oxide of iron purifiers to take up sulphuretted hydrogen. We test the gas, after it has left these, with the sulphur test. We apply it three times—once after the first purifier, once after the second, and another time after the oxide of iron; and we judge by that sulphur test how long we can safely keep the lime in the purifier. I judge it now after the condensation is analyzed. We change it when necessary. I remember hearing that the gas referees came to Bow in 1871, but I had no communication with them. All the sulphur impurities could not then be removed, nor can they now. I am not prepared to go into the question whether it is still uncertain, or was uncertain at that time, in what form the impurity exists in the gas. I cannot say whether it is true that my company exceeded the maximum of 20 grains, per 100 cubic feet of gas, 45 times out of every 100 experiments in the year 1869.

Re-examined by Sir H. JAMES: I am under the direction of Mr. Harris, who is the engineer. The defendant company had nothing to do with the works until 1870, and I was not employed by them until that time. In 1869 Mr. Evans had nothing at all to do with the works. The name of our company until 1870 was the Great Central. When the defendant company took over the works Mr. Harris remained, as did I. We employed at Bow from 250 to 300 men. The works are not nearly so large as those at Beckton. We are making about the same quantity of gas at Bow as we previously did. Three of the purifiers are used for lime, and four for oxide of iron. Inside the purifiers there are four vertical trays, one above the other. The bisulphide of carbon test we always keep there, because that is a prohibited impurity. The test is fixed, and always in use between Nos. 1 and 2 and Nos. 2 and 3 of the lime purifiers. We sometimes test for carbonic acid out of curiosity, and also for sulphuretted hydrogen; that is done by acetate of lead. When the lime comes out of the first purifier, after it has done its work, it is dark green. It has absorbed carbonic acid, bisulphide of carbon, and sulphuretted hydrogen. I cannot say of which it has absorbed the most. We began to remove the first purifier, as we do now, in 1867. I have made no alteration at all in the mode of working since 1867 in any way whatever with respect to the three dry lime purifiers; and if the bisulphide of carbon test shows less bisulphide of carbon now than it did then, it is the result of my practical experience. I know how much gas I can pass through; when I first began to test I did not. I was trying experiments in 1866 and 1867. I have made no alteration in the manner of working the purifiers. The quality of coal makes a difference in the amount of sulphur; and the same may be said of that which is supposed to be the same coal. It varies as to the amount of sulphur. Since 1867 I have always kept the first purifiers in work about the same time in relation to the same number of cubic feet. I always endeavour to keep the lime below the amount of sulphur in the crude gas. In crude gas it is 36 to 38 grains per 100 cubic feet. If I find the purifier above 40, I change; if I found it 20, I should not change until it came up to 40, because the lime has not done its work. The manner in which we work those purifiers is a thing known to the workmen and others at the Bow gas-works. The lime is changed by workmen; and whether I am speaking the truth the workmen there could tell.

Mr. *Robert Harris*, cross-examined by Mr. FRY.

I have the management of the Bow works, and had for some time before they belonged to the defendant company. They did not pass into the possession of the defendant company until 1870. No doubt the daily records of the proceedings at Bow, published in the appendix to the report of the gas referees, are correct. In 1867 we began the process we are now using, and have continued it ever since. That included sulphur testing as now employed. By sulphur testing, I mean testing for bisulphide of carbon. In 1867 we used what was known as the Letheby test; we now use what is called the gas referees test. The principle of the test is the same; the machinery is not the same. We now test for bisulphide of carbon at three points—at the outlet of our first lime purifier, at the outlet of our second lime purifier, and at the outlet of our station-meter, which is practically at the outlet of our oxide purifier. We first tested for sulphur at the outlet of our second lime purifier, when we began the present system of purification. That was in November, 1867. In November, 1867, I applied a test for bisulphide of carbon at the outlet of the second lime purifier. I think I might say I am positive about that. I will undertake to say that in November, 1867, I tested for bisulphide of carbon at the outlet of the second lime purifier. Perhaps I had better say I cannot tell exactly when that began. In my affidavit I have described the gas passing from the scrubbers to the purifiers. It goes first to the lime purifiers. The object of using the lime is to remove the bisulphide of carbon. We do not use it to extract carbonic acid, but the lime does it. The presence of carbonic acid is immaterial, because gas may be considered pure which contains carbonic acid. We do not use lime to extract sulphuretted hydrogen; we rely upon the oxide of iron for that in the one set of purifiers. The only purpose for which we use the lime is for the bisulphide of carbon, it extracts the carbonic acid, but it is only incidentally. I recollect a meeting of the Society of Engineers on the 10th of November, 1868, at which Mr. Gore read a paper on "Modern Gas-Works at Home and Abroad." I took part in the discussion which followed. I said on that occasion that the question of the carbonic acid being left in the gas was merely one of pounds, shillings, and pence, and was whether it was more economical to take it out by means of lime, or compensate for any decrease in the illuminating power by the use of a more light-producing coal. I adhere to that opinion now. I believe I had previously spoken as to the effect of carbonic acid upon sulphide of calcium, and also as to the effect of sulphide of calcium upon bisulphide of carbon. It was simply a question whether it was more economical to leave carbonic acid in the gas or not. Gas containing carbonic acid is commercially pure, as well as that which does not. Gas containing bisulphide of carbon is not commercially pure. The use of the term carbonic acid by me in the portion of the discussion referred to, does not refer to the question of the effect of carbonic acid upon purification. I knew the effect of that years ago. Carbonic acid is not spoken of there in any way connected with purification. The meeting was to discuss modern gas-works at home and abroad. The question of purification certainly came before the meeting, and I expressed the opinion that the question of carbonic acid was a matter of pounds, shillings, and pence; but not in connexion with purification. I remember that gas referees were appointed; but I do not recollect the date. I forwarded to the referees in September, 1869, a report, under the head of "Processes and Results." The statements made in that report are true. In May, 1870, I stated that the companies would not be safe if the maximum were fixed

at 50 grains. In October, 1871, there was a great rise in the quantity of sulphur at Bow; it got up to 73 grains. I do not know whether I was aware of the protests made by the gas companies against fixing the maximum at 30 grains. I objected to the maximum, because I had not such perfect control as to enable the companies to obey the maximum; and I did not concur in the fixing, when the maximum was fixed. I have accepted the maximum, and can work to it tolerably well; we exceed it very rarely. I worked at the maximum in 1867. We were under a penalty at that time if we had more than 20 grains in 100 cubic feet. We worked down when the referees fixed their standard, and I believe that was in the autumn of 1872. From 1868 till the autumn of 1872 there was no maximum fixed at all. In October, 1871, I believe I received from Mr. Foster, the secretary to the gas referees, a letter of inquiry about the large amount of sulphur impurity. I do not recollect calling on Mr. Foster with regard to that; but no doubt I did. Very likely I said if I had a secret for keeping the sulphur down I should make my fortune. In March, 1872, I first introduced the system of slaking the lime with the smallest possible quantity of water. About that time we used more lime, arising from changing our purifiers more frequently. As we take the first out, the second and third come in. I believe the increase for the year was something like 50 per cent. The change in March, 1872, was not very conscious.

Did you designedly make that change in March, 1872?—I am really at a loss how to answer the question. Of course it was knowingly done.

Not designedly?—That is the nearest answer I can give. I was going to say that at that time, before and since, our habit was to change our lime purifiers when the bisulphide of carbon showed a certain number of grains per 100 feet. Then we took a lower standard, and, therefore, we had to change more frequently; instead of changing at 16 grains, we changed at 14 grains. The change was made with the design of keeping it down. It had been more prominently brought before me in June, 1875, than in June, 1872.

Re-examined by Sir H. JAMES: Mr. Gore's paper was not confined to purification. According to my view, we have not now complete power over the purification of gas. I shall never consider that we have until a means is discovered to remove all the bisulphide of carbon. Even now the amount of impurity varies, and I cannot trace the causes entirely. As we go on, we occasionally get more information. We have never changed anything in our system of purification, or in our practice of purification, since Nov. 16, 1867. The quantity of lime used is continually altering, according to the kind of coal used. Our first three purifiers are used exclusively with what is technically known as dry lime. Two out of the three are used together. Both are used for the purpose of removing bisulphide of carbon. That is the main object. As an absolute fact, the first purifier removes carbonic acid. That results from the greater affinity that carbonic acid has for lime. The first absorption is sulphuretted hydrogen; then the carbonic acid, being absorbed in greater quantities, drives the sulphuretted hydrogen forward. The lime, becoming carbonate of lime, is taken out of the first purifier. We have pursued exactly that same course since November, 1867. We produce the same result, notwithstanding the change of purifiers. We have made slight experimental variations since 1867, and upon the broad principle of working there has been no variation whatever. In 1871 there was no maximum fixed by legislation as regarded our company. The Act of 1860 had then been repealed. If we looked only to the interest of the company, we should prefer having no maximum. In October, 1871, a break-down took place in the purifier. At that time we could not trace it, but, from what we have since learned, we have no doubt it arose from an accidental admixture of atmospheric air with the gas. I can repeat that operation now any day that I like.

The VICE-CHANCELLOR: That finishes the cross-examination?

Mr. FRY: Yes, my lord.

Adjourned until Hilary sittings.

WIRKSWORTH COUNTY COURT.—MONDAY, DEC. 20.

(*Before Mr.* W. F. WOODFORDE, *Judge.*)

ACTION FOR DAMAGES BY AN EXPLOSION OF GAS. CONTRIBUTORY NEGLIGENCE.

PARKIN *v.* WIRKSWORTH GAS COMPANY.

The plaintiff in this case, Mr. John Parkin, land agent and surveyor, of Idridgehay, near Wirksworth, sued the Wirksworth Gas Company for £4 9s. 2d., amount of damage done by an explosion of gas at a house occupied by Mr. Francis Ogdon, and belonging to plaintiff, situate in Coldwell Street, Wirksworth.

Mr. KINGDON appeared for plaintiff, and Mr. STONE for defendants.

From the evidence adduced, it appears that on the 28th of December Mr. Ogdon noticed a strong smell of gas about midnight, and got up to open the windows. He then went to bed again, but became so ill from the smell of the gas as to be unable to leave his bed the next morning, and a neighbour named Savidge, a plumber, was sent for to discover the escape. Two or three persons were assisting in the search, one of whom inadvertently lit a candle, and placed it on the ground, when an explosion immediately occurred, blowing up the passage and tearing down the front door and wainscoating. It was shown that the service-pipes in the house were all in good order, and the explosion, therefore, was attributed to an escape from the main-pipe laid down in the street, by which a drain leading from Mr. Ogdon's to the main sewer (under the gas main) became filled with gas, which took fire upon coming in contact with the lighted candle.

Mr. STONE addressed the court in defence, after which

The JUDGE summed up, saying that it appeared in the evidence there was a breakage in defendant's main of sufficient size to cause an escape of gas, which got into the sewer. This escape was discovered in the night when the windows were open, but no further steps taken until eight o'clock next morning. It was printed on the back of defendant's bills that the first thing to do in a case of this sort was to send at once for the gas manager, but here, although the escape was known for hours previous to the explosion, such request was not complied with. Instead of doing so, the tenant called in a person who was supposed to be a scientific man, and this person, with his assistants, procured a lighted candle to ascertain the origin of the escape. As a very natural consequence there followed an explosion, which he did not doubt was caused by the careless and improvident use of the candle. Had they opened the doors and windows instead, an explosion would not have happened. Here was an escape going on for hours, and the point to be considered was, were the company guilty of negligence in not repairing their pipes? There was no evidence before him to show that this escape had been brought to their knowledge. He considered that plaintiff had been guilty of contributory negligence in not letting defendants know of the escape, and should, therefore, give judgment for the company.

BRADFORD POLICE COURT.—FRIDAY, DEC. 24.

(*Before Mr.* SUTCLIFFE *and other Magistrates.*)

ILLEGAL CONNEXION OF SERVICE-PIPES.

The TOWN-CLERK of BRADFORD attended to prosecute several persons for breaches of the Gas-Works Clauses Act.

The first case was that of *Thomas Burnett*, plumber, in the employment of Messrs. John Priestman and Co., Thornton Road, who was charged with illegally making a connexion with the gas-main of the corporation at the house, No. 74, Horton Street, without giving notice to the authorities.

The TOWN-CLERK admitted that the defendant had told the man for whom he made the connexion to give notice to the gas officials, and such a notice was sent; but it was essential that the plumbers themselves should give proper notice.

Defendant was fined 10s. and costs, or the alternative of 14 days imprisonment.

William Walker, plumber, 491, Leeds Road, was summoned for making a connexion with the main at 17A, Carnation Street, in the occupation of Mr. John Conway, Ivegate, and Mr. Conway was summoned for using the gas without entering into a contract for the supply of the same. The last-named defendant lives in his own house, and the adjoining one is in the occupation of a man named Dobson. Some time ago both houses were supplied with gas through one meter, and Mr. Conway wished to have a meter for each house. He told Dobson to get the work done, and Dobson, according to his own account, gave notice of what he was about to do, at the gas office; but without obtaining the consent of the authorities, he employed Walker to lay a pipe from the main, where it joined his meter, to Conway's house. Walker laid a pipe as directed. It was a composition pipe, instead of the kind usually used, and, being laid through the partition wall, was liable to be eaten by rats or mice, and might have been the cause of a serious explosion. The gas supplied to Conway's house did not pass through any meter at all. Some time after this had been done, Mr. Conway, according to the statement of Mr. Hutchinson, who appeared for this defendant, found that the meter was not registering properly, and at once sent a postcard to Mr. Swallow, the gas-works manager, to look after it.

Mr. SUTCLIFFE said that the magistrates considered this a very serious case. People must in all cases obtain the sanction of the authorities before any step was taken to connect a pipe with the corporation main; and the magistrates were determined to deal very severely with any cases of this kind that should come before them. In this case gas had been consumed surreptitiously, and the connexion with the main was of such a nature that an explosion might have been caused, or the inmates of the house suffocated. Walker would be fined £2 10s. and costs, with the alternative of a month's imprisonment; and Conway would have to pay a fine of £5 and costs, with the alternative of two months imprisonment.

ROCHESTER POLICE COURT.—THURSDAY, DEC. 16.

(*Before Mr.* GUISE.)

COMMITTAL FOR NON-PAYMENT OF GAS-RENT.

John Hughes, the landlord of the Royal Exchange public-house, High Street, whose licence was a short time since forfeited after he had been repeatedly convicted, was charged with non-payment of the sum of £2 1s. due to the gas company for gas supplied while he kept the house, an order having previously been made by the court.

The *Defendant* said he had not the means for paying the demand, but it was stated that on the day the sum was demanded the defendant had a large amount in his possession.

Mr. GUISE ordered the defendant to be imprisoned for three weeks, unless the sum and costs were paid.

Miscellaneous News.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

The Half-Yearly Meeting of Shareholders was held at the Office of the Company, 60, Cornhill, London, on Tuesday, the 21st inst.—THOMAS HUGHES, Esq., Q.C., in the chair.

The SECRETARY (Mr. A. Lass) read the notice convening the meeting, and the following report and statement of accounts were taken as read:—

The directors have much pleasure in submitting to the shareholders the accounts of the company for the half year ending June 30, 1875. These, with the annexed report of the engineer, show the progress of the company. The directors have to state that the profit for the half year has amounted to £1106 13s. 10½d., and that, after bringing forward the balance of the last account, paying the dividend to Dec. 31, 1874, and the interest on the loans to June 30, 1875, there remains an available balance of £803 9s. 3d., out of which the directors recommend the declaration of a dividend for the half year ending the 30th of June last, at the rate of 5 per cent. per annum.

The gas-rental is steadily increasing. The new gasholder, additional retorts and plant, have been forwarded from England, and will be erected at Georgetown as speedily as possible. The directors regret to have to report the death of Mr. John Drysdale one of the directors. The dividend will be payable on Jan. 1, 1876.

ENGINEER'S REPORT.

Gentlemen,—The stock returns, statement of accounts, &c., for the half year ending June 30, 1875, will, I trust, be found correct, and that the result of the six months working may be deemed satisfactory.

The consumption of gas is steadily and satisfactorily increasing; but the sales of coke cannot be deemed very satisfactory.

The fitting department continues fully employed, during the half year 27 houses have been fitted with 322 lights, additional lights 72, public lamps 6, in all 400 lights, and 2 cooking stoves.

The buildings and the whole of the plant are in a very satisfactory and efficient state of repair. The gasholder continues to work satisfactorily, and with the tank and all iron-work, where practicable, have frequent coats of tar to preserve them from rust, &c.

In the purifying department all is working well.

The engineer's bi-monthly reports, together with the monthly carbonizing statements, give all information as to the working in the manufacture and distribution departments.

The unaccounted-for gas continues small.

There has been no loss by exchange on the total amount remitted.

The additional charges to capital account for the half year are for new mains and services, and coal stores.

In conclusion, I would beg to congratulate the board on the steadily improving prospects of the company; the working expenses are reduced to as low a point as is consistent with safe working, the make of gas per ton of coal is good, and if our future supply of coal can be obtained at reasonable rates, the prospects of the undertaking may, in my opinion, be taken as very encouraging.

Dr. — *Balance-Sheet, June 30, 1875.* — *Cr.*

Share capital—				Fixed plant, mains, and services, as per last account	£29,180	1	0
6200 shares, at £5. . . .	£31,000	0	0	Less credits	22	5	0
Less calls unpaid	2,685	0	0		£29,157	16	0
	£28,315	0	0	Stock in hand.	4,834	2	8½
Debenture bonds	6,300	0	0	Cash at bank and in hand .	789	12	3½
Retort renewal-fund account	36	8	2	Bills receivable	1,400	0	0
Bills payable	2,555	4	9	Amounts owing by sundry persons	3,456	19	2
Amounts owing to sundry persons	1,628	8	0				
Profit and loss account—net revenue	803	9	3				
	£39,638	10	2		£39,638	10	2

Revenue Account, June 30, 1875.

Coals and bitumen . . .	£1,019	11	0	Gas and rental of meters .	£3,119	13	8½
Purifying account . . .	30	2	0	Residual products, fittings, and miscellaneous sales .	677	19	5
Wages account	405	16	10				
Repairs and maintenance of works and plant, &c. . .	99	14	3½				
Salaries.	643	15	0				
Rent, rates, and taxes . .	167	8	11½				
Directors and auditors fees	155	5	0				
Trade and general charges.	98	5	10				
Bad debts and allowances .	61	2	3				
Law expenses.	9	18	1				
Balance carried to profit and loss—net revenue .	1,106	13	10½				
	£3,797	13	1½		£3,797	13	1½

The CHAIRMAN, in moving that a dividend at the rate of 5 per cent. per annum be declared payable on the 1st proximo, said he was sure that any one who had looked at the balance-sheet and statement, would be ready to congratulate the company upon the steady progress in their business during the last year, a progress which fully entitled the shareholders to the dividend now declared. He would only detain the meeting for one minute in stating the points which he thought were most satisfactory in the circumstances of the last year. The first of those was, that the consumption of gas was steadily on the increase, comparing the revenue of the past half year with that of the corresponding period of 1874, he found that whereas in the last-named period the private consumption amounted to £1402, and the public lighting to £875, making a total of £2277; in the half year, ending June, 1875, the private lighting amounted to £2183, and the public lighting to £898, being a total of £3081, or an increase of £804. Another satisfactory point was that the increase in the profit during the past half year over that of the corresponding period in 1874 was almost entirely composed of the profit on the increased consumption of gas, a result which was the best that any company could hope to see. He might further state, for the information of the shareholders, that the accounts of the company were in a state which, to his mind, was exceedingly satisfactory. He was bound all the more to say so, because he felt it right to give credit where credit was due. The very remarkable accuracy with which the accounts were kept, and the control which was exercised over the works on the other side of the Atlantic had been obtained chiefly through the exertions of the vice-chairman (Mr. H. P. Stephenson), who, he (the chairman) always felt, ought to occupy the position which the shareholders had assigned to him. Mr. Stephenson's accurate knowledge of all these things, and his readiness to devote his knowledge and experience to the service of the company were matters for which he felt himself, and the shareholders as a body, ought to be grateful. The intelligence and energy of Mr. Stephenson were most admirably seconded by Mr. Lass, who was so excellent an accountant, and so vigilant in bringing under the notice of the manager (Mr. Blanchett) any points which it is desirable to call his attention to, that he (the chairman) certainly thought no more satisfactory service could be rendered to any company than was rendered to this by their principal officers. Having thus eased his mind of the great obligations he felt that he owed to Mr. Stephenson and Mr. Lass for the excellent service they had done, and which, to a large extent, accounted for the prosperity of the company, he would, without further observation, move the resolution for the declaration of the dividend.

Mr. H. P. STEPHENSON seconded the motion, remarking on the efficient and improved working during the half year under the able management of Mr. Blanchett, the engineer and manager at Georgetown, which was put and carried unanimously.

Mr. BLYTH moved a vote of thanks to the chairman and directors for their efficient management of the affairs of the company.

Mr. STOKES seconded the motion, which was put and carried.

The CHAIRMAN briefly acknowledged the compliment, and the proceedings terminated.

CHELSEA WATER-WORKS COMPANY.

The Half-Yearly General Meeting of Shareholders was held at the Company's Offices, Pimlico, on Thursday last—Mr. DEEDES presiding.

The report stated that the income from water-rates for the half year amounted to £46,774 8s. 3d., against £42,009 11s. 5d. in the corresponding period of last year. The quantity of water pumped from the Kingston works to the service reservoir on Putney Heath was 1,452,530,000 gallons, being 114 million gallons less than in the corresponding period of the previous year, the saving being due to the repair of the company's service-pipes and mains, as well as of the tenants fittings, under the requirements of the company's waste inspector. Everything in connexion with the works was in perfectly efficient order. Notwithstanding the difficulties which the contractors had had to contend against, the important work of laying the 36-inch pumping-mains, from the new intake at West Moulsey to the filtering-beds at Seething Wells, was completed on the 11th inst., and opened by the directors on the 16th inst. The engine-house and permanent engines would probably not be completed for some months; but by means of temporary pumps the new supply had now been made available. It was expected that the four large subsidence reservoirs at West Moulsey would be completed in the course of the ensuing year. It was to be borne in mind that the increase of capital necessary to meet the heavy outlay on the new works would involve a considerable additional charge upon the company's revenue. Two bills affecting the property and *status* of the Metropolitan Water Companies were proposed to be introduced into Parliament in the ensuing session. The first, promoted by the Corporation of the City of London and the Metropolitan Board of Works, was intended to confer on those bodies powers to alter the basis on which the companies rates were charged, and to enable persons to require water to be supplied to them for domestic purposes; and the second proposed to transfer to a Royal Commission the powers and properties, duties and liabilities, of the water companies. The directors of the several companies, however, had resolved on taking united action in reference to the bills at the proper time. The board regretted the death of Lord Fitzwalter, one of their colleagues, and the retirement of Mr. Farnham during the half year. They recommended a dividend at the rate of 6 per cent. per annum on the ordinary stock. The capital account stated that the total receipts to the 30th of September had been £984,524, including £86,867 received in the half year; and the total expenditure to the same date had been £979,973, including £58,262 expended in the half year, leaving a balance in favour of the account of £4551. The revenue account stated that the total receipts for the half year had been £47,667; the expenditure on maintenance had been £11,418, and on management £3375. The balance applicable for dividend was £32,906. The contingency-fund amounted to £17,700.

The CHAIRMAN, in moving the adoption of the report and accounts, said he had not much to add, as it was so very satisfactory. The increase in their revenue was mainly due to a revision of the water rental. There had been increased expenditure, which had to be paid out of the water-rates, but they had in most cases kept under the annual value. There was an increase of £4756 in the dividend and interest account. The diminution in the charge against revenue consisted principally in the cheaper rate at which coals were bought, and in the fact that they had consumed about 200 tons less. Various contracts had been entered into for the new works, and most of them had been commenced. Five miles of new main at Moulsey had been completed, and were formally opened on the 16th inst, and he thought he might venture to say that no time had been lost. Authority was given for the company's bill to be introduced a year ago; it was got through the House, the Royal Assent was received in June, and in less than six months after five miles of mains were absolutely opened. Every one had worked well to secure this result. With reference to the two bills they were threatened with, the first was to alter their rating from the gross annual value to the late assessment, which he considered would be unfair. The other bill proposed to take their property and vest it in Royal Commissioners, and also to supply the water by meter. He concluded by feelingly alluding to the death of two of the board of directors since their last meeting.

A SHAREHOLDER, in seconding the motion, said he thought the Government would do very wrong if they passed any Act of Parliament that would take away from them the rights they had previously given them. The company had passed through years of dependency, and it would be very hard to take away their profit as soon as they commenced to make money. Meters for domestic purposes were always, in his opinion, opposed to proper sanitary precautions being taken.

The report and accounts were then unanimously adopted, as was a resolution proposing a dividend at the rate of 6 per cent. per annum.

The meeting concluded with a cordial vote of thanks to the chairman and officers of the company.

WATER SUPPLY AND THE PREVENTION OF FIRES IN THE METROPOLIS.

Lord ALFRED CHURCHILL, chairman of the Council of the Society of Arts, in delivering an address at the opening of the present session of the Society, made the following remarks on the above subject:—

There is another subject of no little importance to the dwellers in this metropolis especially, though the principle involved is not restricted to that alone—viz., the prevention of the spread of fires. We have of late had frightful instances of this in America; Chicago and Boston at once come to our recollection, and remind us that it may be well to look at home in time.

The results of the inquiry directed by the council into what could be done for the prevention of the spread of fire and conflagration, led to the further inquiry how far the application of science and art might be brought to bear on the special improvement of the entire water supply of the metropolis. This important subject still awaits the attention of Parliament to the bill based on the conclusions obtained by the inquiries of the special committee appointed by the council. In the session before last that bill was thrown out by the unexpected opposition of the water companies; for there was reason to expect that they would not have opposed its being taken into committee on the main question affecting them. Last session, compensation facilities were promised on the part of the Government, which it appeared they were unable to realize. But towards the end of the last session, public attention was roused, and in another measure which came before Parliament the popular sentiment prevailed, and a precedent was established, that measures affecting the security of life and property should have the precedence over those that do not. On this new and humane principle it is to be hoped that a due place will be yet accorded to a measure which, as relates to the metropolis, would prevent at least two out of three of the losses of life and personal injuries that regularly occur from fire, and save the great majority of the regular annual sacrifice of more than 200 lives.

It must be remembered that an improved water supply has not reference merely to prevention of fires, but largely affects the health of the population, and greatly facilitates the cleaning of the streets. Thus, proper measures would certainly prevent the injuries annually done to more than 2000 persons in the streets. All this has been clearly shown by the elaborate report issued last session by the committee of this society.

The president of the Association for the Promotion of Social Science, late a Secretary of State for the Home Department, at the meeting held at Brighton, ascribed a large amount of the existing criminality to the widespread drinking habits of the population. But what more powerful cause contributing to drinking habits is there than impure or repulsive supplies of water—of water which, if pure at its source, is made impure by the intermittent mode of distribution, which detains it in butts and vessels in crowded rooms, where it is kept stagnant, and absorbs the mephitic gases, and is made mawkish, offensive, and repulsive? It is not pretended that the provision of pure water is in itself a specific against the great evils of the drinking habits of the population, described in a recent important article in the *Quarterly Review*, but it certainly goes to the removal of a great provocative. Our late lamented member, Sir William Fairbairn, excluded the beer-can rigorously from his works, but he took care to provide for his people the best pure water that could be got. It would have been a sorry conclusion if he had left them the alternative only of water made repulsive by stagnation, in water-butts over cesspools, or water de-aërated in crowded rooms.

The present conditions of the metropolitan supply, besides great waste, are inferiority, if not impurity, in the sources from whence the supply is drawn. It was shown by Mr. Quick and Mr. Rawlinson, and other practical witnesses, that fully one-half the water pumped into the metropolis on the intermittent system is pumped to waste. This is confirmed by the fact that by measures conducted by Mr. Deacon, at Liverpool, where the supply is on a public footing, the consumption has been reduced from 33 gallons on the intermittent system, to 17 gallons per head on the constant system. It follows if that system were adoped in the metropolis one half of the 110 millions daily pumped might be saved, the other half being now pumped to waste. Nearly all this half, or 28 millions, is pumped from the Thames, which is yet sewer tainted, and tainted at times very much with the surface washing of heavily manured lands, giving matter in solution for drinking purposes which filtration has as yet failed to remove.

There is, however, another source of crime to which the present conditions of water supply are contributory to an extent to which the right honourable gentleman must have been ignorant. At present the services of the fire brigade and its engines are limited, as a rule, to the prevention of the spread of fires beyond the premises where they occur. The incendiary for insurance money is pretty sure to have his object accomplished, and the trace of his work is limited to the particular house, and obliterated before the fire-engines can arrive. How systematically this work goes on is shown in the evidence collected by our member, Mr. M'Lagan. Mr. Tozer, in his evidence, showed that one-third, at least, of the serious fires in London, are not accidental, but intentional, and criminal. But if water can, by means of hydrants, be applied, as it is proved it may be, in 2 minutes instead of 24, by fire-engines, incendiary speculators for insurance money are baffled.

Whilst the supply of the metropolis still remains in the hands of private companies, and there are eight of these companies who divide the metropolitan supply among them, it is obvious that the first and main object must be, and indeed it is their duty, so to manage their affairs as to give the largest amount of dividend to their shareholders. This can hardly be consistent with a due regard to the perfect interest of the consumers. Doubtless, under unity of management, large economy could be effected, and, if administered on a public footing, the water supply might be rendered far more effective for the public benefit. A constant supply, with hydrants at frequent intervals, might be obtained without further burthen on the ratepayer, who would thus obtain a more adequate protection from fire, and increased facilities for cleanliness in the streets. Manchester and Liverpool are instances in proof. If unity of works and management had been got when it was first proposed, the extension of duplicate and triplicate trunk mains (one of them, extending from east to west, costing upwards of a million of money), extended reservoirs, providing for a waste, under the present system, of nearly double the actual consumption, would not have been incurred. Now, nearly the actual draught from the Thames, and the continuance of multiplied establishments, might all have been spared, and the expenditure of some three millions of money might have been, by unity, prevented, and the shareholders have received improved dividends from the profits which have gone elsewhere.

It is to be observed that the Metropolitan Board of Works have, in consequence of the complaints on account of the increased rating by the water companies, given notice of a bill to equalize the rate, and to extend a system of supply by meters to private houses. In this course, leaving the supplies to the separate companies as they are, that board practically confirms the conclusion come to as to its ineligibility, from the restricted area of its jurisdiction

and other causes, to take upon it the responsibility of undertaking the supplies directly for the public. But it is apprehended that, as separate works and extensions, and expenditures for them to an indefinite extent must still go on, together with the expenditure on multiplied establishments and directorates, that any considerable augmentations of dividend to the shareholders, or any material reduction of rates to the consumers, must be very remote.

The only practical source of considerable economy and early relief must be sought in the economy and great gains of unity of management on a public footing. Colonel Beresford, the member for Southwark, has renewed his notice of a bill on the basis of the report of the special committee, which, it is acknowledged, has done gratis the work of a very special commission on the subject. But it is submitted that the work is of a nature that ought not to be left to them, or to any private member, however competent, nor to any overworked sub-department, and that it is befitting the care of a superior department and Cabinet Minister.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

On Friday afternoon the whole of the iron and steel works, foundries, and, indeed, all the industrial establishments of whatever description, were closed for the Christmas holidays. The interval is this season likely to be of very long duration, owing to the extreme depression which pervades almost every department of the iron and steel trades, not only here, but throughout the whole country. In several branches of both these industries the incoming of the New Year will, in all probability, bring about several important changes.

During the past week there were but a limited number of sales of forge pig iron; but several good lots of foundry pig have changed hands, at prices which show no falling off as compared with those obtained during the preceding week. The agents here of North of England firms now quote the subjoined prices:—No. 1 foundry, 54s.; No. 2 foundry, 52s.; No. 3 foundry, 50s.; No. 4 foundry, 49s. 6d.; No. 4 forge, grey, 49s. 6d.; No. 5 forge, mottled, 49s.; No. 6 forge, white, 48s.; refined metal, 70s.; Kentledge, 58s.; and cinder pig, 40s. per ton, for net cash.

In ordinary merchant iron there has been no alteration whatever. Common bars remain at about £8 per ton, and good medium at £9 to £10.

The coal trade is fairly active, especially in house qualities. Steam coal is not selling so well now; but there are large and regular deliveries, on account of gas contracts, to various local and other companies.

IRON AND COAL TRADES OF SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE.

(FROM OUR OWN CORRESPONDENT.)

Owing to the near approach of the Christmas holidays, there has this week been rather more activity at the mills and forges throughout the district. There is, however, no improvement in demand, and it is not improbable that, owing to the depressed condition of the iron trade, the holidays will this year be more than usually prolonged. Prices are moderately steady, owing to the great cost of production, and there is considerable difference in the rates ruling in this district and those current in the North country centres of production. There is an exceptional decline of £1 per ton on best charcoal sheets declared by the Cookley Iron Company; but Messrs. Baldwin and the other leading firms have as yet made no alteration. Common bars are quoted £8 to £8 5s., and best marked bars £10 to £10 12s. 6d. per ton. The only classes of finished iron which just now command any noteworthy attention are sheets and plates. In pig iron the market is somewhat firmer in tone, owing to the restricted stocks and the dearness of fuel. Common cinder pigs are 2s. 6d. per ton higher, the range being £3 to £3 5s. per ton; and best native all-mine are steady at £4 15s. for hot-air, and £6 for cold-air makes. Considerable supplies of hematite and other North country pigs are finding their way into this district, and are competing with medium and common pigs of local make. It is probable that, in the absence of any decided improvement in the demand, more furnaces will be "blown out" early next year.

The coal trade is very buoyant, and in many parts of the district the output is inadequate to the current demand. Prices are firm all round, and there are rumours, which at present, however, are unauthenticated, that Earl Dudley is contemplating another advance. There are great complaints throughout the district of the scarcity of skilled miners, but for which circumstance the aggregate output would be very considerably increased. The Bilston Gas Company have concluded the purchase of an eligible site, upon which they propose to commence the erection of new works early next year.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

This week the Christmas holidays are naturally interfering with the ordinary course of business both in the coal and iron trades of this district, and there is little basis for anything like a reliable report.

The exceptional mildness of the weather has caused rather a falling off in the demand for house coal, but prices are firm, as stocks are low, and the usual supplies from the pits will be stopped during the next week. For engine classes of fuel there has been only a limited demand, as many of the works are now closed for the holidays. The advances in round coal at the end of the month, which were being talked about in some quarters, are now not at all probable, though it is expected, and the present rates will be fully maintained. The pit prices in the Wigan district remain about as under:—Good Arley and King coal, 14s. to 15s. per ton; Pemberton four-feet, 11s. 6d. to 12s. 6d.; common coal, 9s. to 9s. 6d.; burgy, 6s. to 6s. 6d., and slack, 3s. to 4s. per ton.

For gas coal there is a continued good inquiry, and full prices are realized. Ordinary screened Wigan coal at the pit is quoted at 10s. 6d. to 11s. per ton; good Arley nuts at 11s. to 12s.; and good screened Arley, 13s. 6d. and 14s. 6d. per ton.

There has been a little more doing in the shipping trade, but high prices are still difficult to obtain.

Coke continues a complete drug in the market, and there is a keen competition for the few orders that are to be secured.

In the iron trade, prices of pig iron are considerably stiffer, but the advanced rates can only be regarded as nominal, as there is little or no buying going on, both consumers and makers preferring to wait until after the turn of the holidays, before entering into engagements. Finished iron has been a little more active, and prices are stiffer to the extent of 2s. 6d. per ton, Lancashire bars delivered are worth about £8; Middlesbrough do., £7 17s. 6d. per ton, and other descriptions of finished iron in proportion.

The various finished iron-works were closed on Friday for the holidays, and in many cases will not be opened for a week.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

There were again very ample arrivals of light tonnage in the Northern coal ports. But from the fact that many of the small coasters had come to load on their owners account, and that coals were very much needed on the east and south-east coasts and British Channel, most of the handy ships seeking engagements were taken up, and there was no very material reduction upon rates. In consequence of the loading berths being well supplied with ships, coal turns, especially for household and gas coals, are much longer, and many of the fleet of small sailing vessels will not be loaded until the middle of January. There has been a great deal more activity at the pits. As gas coals of all kinds are needed in the small Southern ports, the shipments are likely to continue busy for some time. There is no change in prices. Very few additional contracts for gas coals have been entered into. Indeed, it is quite likely that little will be done in that direction until the awards of the umpires are given in respect to the arbitration upon pitmen's wages. Less time will be lost at the collieries this Christmas than for many years past. As there is an abundance of tonnage in the ports, and a fair number of orders on the books of the colliery offices, the men will only be too glad to take work when it is offered them. A day will probably be lost this week, and another one next week. That will be all.

With regard to the general coal trade of the North of England, households continue in good demand, and most of the leading collieries are working full time. A somewhat better business has been done for first-class steam coals, and there has been an improved inquiry for some sorts of manufacturing coals.

There is a very large number of steamers in the Tyne and adjacent ports, which are ready to enter the coasting or any other trade where there is immediate employment. The coasting rates for steamers are decidedly lower.

The iron trade of the Cleveland and Tyneside districts is no worse. It is very quiet, however, and several of the works have very little employment on hand. It is the dullest Christmas that has been experienced in the Cleveland district for many years, and a great amount of destitution prevails amongst working men.

The shipments of goods from the Tyne to the Continent and to London continue to be pretty active. A good few chemicals have been shipped to Holland, Belgium, and France. Fire-clay goods have also been inquired after for France, but the latter business is not very busy. Building materials of all kinds keep up in price in the North; but in every other respect the market for general merchandise favours the buyers.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

It would almost seem as if the question of which is the best gas in Scotland, so far as illuminating power is concerned, had not yet been settled. Mr. Brazier, professor of chemistry in the University of Aberdeen, and gas analyst to the corporation of that city, had occasion lately, in the course of a public lecture, to refer to the matter. Speaking of the complaints sometimes heard in Aberdeen regarding the dimness of the gaslight on winter evenings, the learned professor took occasion to say that this was not, as was generally supposed, owing to the gas being of inferior quality, but in consequence of its superior excellence, the fact being that Aberdeen gas contained more illuminating power than that of any other town in the kingdom, only its illuminating power was caused by its containing a large amount of naphtha tar, which had the disadvantage of being liable to condensation by frost.

On the evening of Monday, the 20th inst., the Corporation Gas Commissioners of Forfar held their ordinary monthly meeting, on which occasion a discussion arose as to the amount of gas consumed by the public lamps, and the price paid for the same by the Police Commissioners. The manager of the gas-works had complained that the commissioners did not pay a sufficiently adequate sum for the gas consumed. They only paid for two cubic feet of gas per hour for each lamp, which was the quantity the burners were guaranteed to consume, whereas it appeared that most of the lamps were consuming more than four feet per hour. It was resolved that the Gas Committee should bring up a report on the subject at the next monthly meeting.

The new gas company that was projected some months ago for Bothwell and Uddingston has not yet formally put an end to its existence, but it is reported that it has become so completely demoralized as to give no hope that it will ever assume a condition of vital activity. The opinion that the formation of the new company was a mistake is not confined to the shareholders, but has now also taken possession of one or more of the directors.

The Town Council of Paisley, at their last meeting, had under consideration the proposed extension of the corporation water-works. Provost Murray, in referring to the minutes of the Water Commissioners, explained that it had been proposed to seek powers from Parliament to borrow £40,000 to execute additional works at Rowbank reservoir, &c. Part of the works authorized by the Act of 1866 had not been executed, and the power to execute those works will expire next May. It was necessary, therefore, he said, to seek an extension of those powers. The commissioners had never constructed the new filters at Crossbar for the low-level supply, which were estimated to cost £10,000, nor had they obtained the extra supply at Rowbank and Glenburn, which was estimated to cost £17,000. It would be a question in a few years whether they or their successors would not require to carry out those works, and therefore it was necessary to obtain the powers to do so without any further delay.

The Water Commissioners of the Burgh of Hamilton, being about to extend their existing water-works by constructing two additional reservoirs, with the necessary embankments and conduit, as provided for by the Act obtained last session, have, after careful consideration, accepted the offer of Mr. John Scott, contractor, Dalry, for the construction of the works. When completed, the three reservoirs will give an aggregate of about 22 acres for storeage of water, and provide an ample supply for the wants of a population of 20,000. The works will be commenced early in the New Year, and the cost will be about £7000. Mr. Scott is also engaged in similar works at Dalry and Beith.

A few days ago the first meeting of the Busby Water Company was held. It has been formed for the purpose of supplying the village and feuars with gravitation water. A report was read to the meeting, showing that the contractors were busily pushing on the necessary works, and that the district would be supplied with the desired water within the next two or three months.

The operations in connexion with the extension of the water-works at Cambuslang are now being prosecuted with considerable vigour. In a few days an additional pipe will be delivering water into the village. An important drainage scheme for the same place is also about to be carried out.

The local authority of the parish of Keith, county of Banff, have resolved to form the towns of Keith and Fife-Keith, with a population of 3600, into a special water supply district. Hitherto the water used in those towns has been drawn from wells which are exposed to impurities from drainage; but it is now proposed to bring water from some distance by gravitation.

There has been another burst in the line of piping leading from the Loch of Lintrathen. The contractors seem to think that there is no need to continue to apply the hydrostatic test.

The pig iron market has been very animated during the past week, and an advance of 2s. per ton was made on the price between Monday and Friday, the price on the last-named day being 64s. 7½d. cash, and 64s. 9d. one month open.

From 3d. to 6d. per ton has been added to the price of coal for early delivery, but the demand for house coal is a shade easier. Some of the colliers still complain of the scarcity of empty waggons.

POOLE GAS SUPPLY.—A new company has just been registered under the title of the Town and County of Poole Gas and Coke Company, Limited. This is the registration of a company originally constituted by deed of settlement on the 22nd of July, 1833. It is brought under the Companies Acts 1862 and 1867 as a limited company, in accordance with the resolution of a general meeting of the shareholders. The capital of £9600 is divided into 400 shares of £10 each, 400 of £2 each, and 480 new shares of £10 each, all of which are taken, and, with the exception of 75 new shares recently allotted, are fully paid.

CITY OF ST. PETERSBURG NEW WATER-WORKS COMPANY, LIMITED.—A report just made to the directors of this company by their secretary states that the works in Vassili Ostroff and Old St. Petersburg are finished, and have been officially inspected and approved by the engineers appointed for that purpose by the chief of the police and the municipality. In both those districts the company have commenced supplying water to the inhabitants. The number of applications for house services is very satisfactory, and considerably exceeded those made to the old company at the opening of the works. Upwards of 100 house services have been already finished, and others are in progress; but, owing to the severity of an unusually early winter, it is impossible to comply with all the applications which are received. Work will, however, be recommenced at the earliest opportunity. By the regulations of the St. Petersburg police, no work in the streets is allowed after the commencement of October, but, owing to the kindness of General Trepoff, the chief of the police, an exception has been made in this point in favour of the company. The depth, however, to which the frost has already penetrated in the ground renders work slow and laborious, and considerably increases its cost. The directors have every reason to be satisfied with the ability and energy displayed by their general manager at St. Petersburg.

TESTIMONIAL TO MR. DAND.—On Thursday, the 23rd inst., the *employés* of the Exeter Gaslight and Coke Company met together, at the Basin station, for the purpose of presenting Mr. Thomas Dand, C.E., with a handsome testimonial, on the occasion of his resigning the office of engineer and manager to the company, as a mark of their respect and esteem entertained towards him, and in recognition of his many kindnesses to the staff. The presentation was made, on behalf of the men, by Mr. S. Skoines, and consisted of a very handsome silver salver and a beautifully illuminated address, containing the names of the subscribers. At the same time, Mrs. Dand was presented with a silver sugar-basin and cream-jug. Mr. Dand, in responding, thanked the men most heartily for the very handsome present they had just made him, and said he had always found them willing to help him at any time, and in any emergency. He was sorry to leave them, and should always look back with feelings of pleasure on the 12 years he had spent with them. He hoped his successor would do equally as well with them as he had done. The men were afterwards addressed by Mr. W. A. Padfield, the secretary of the company; and Mr. W. Stansfield, Mr. Dand's successor, and, after several rounds of cheers had been given for the above-named gentlemen, and for Mr. Dand and family, the meeting separated.

INSTITUTION OF CIVIL ENGINEERS.— The fifty-eighth annual meeting of the members of this incorporated society was held on Tuesday, the 21st inst.— Mr. Thomas E. Harrison, the president, in the chair. The report of the council in the first place congratulated the institution upon a year of decided progress. During the last 12 months there had been an effective increase of 35 members and of 126 associates, with a decrease of one honorary member. There were on the books, on the 30th of November last, 826 members, 1449 associates, and 14 honorary members; together, 2289 of all classes. This was irrespective of the students, of whom there were now 328. It was stated that the income proper had in the past year amounted to £8053; the receipts from admissions, fees, &c., were £2114; and from trust funds, £456. The general expenditure had reached £4917, while the disbursements for publications were £3102. The investments on account of capital had been £2078, and on account of unexpended dividends on the Telford and Miller Funds, £114 8s. 2d. and £114 14s. 10d. respectively. The trust funds were of the nominal or par value of £14,171; the institution investments of £20,876; together, £35,047. Of these funds a sum of £12,115 was placed on Government securities, and £22,932 stood in nearly equal proportions in guaranteed stocks of seven of the principal railway companies. It was remarked that during the time the institution had been in existence the wealth of the world had been largely developed, mainly by the facilities of intercommunication by railways, harbours, and ocean steamships, by telegraphs and improvements in machinery, the work principally of civil engineers. These inventions had tended to promote personal intercourse between the peoples of different nations, had fostered material and intellectural progress, and had increased the comfort and the welfare of all classes of society. After the reading of the report, the premiums awarded for some of the original communications read at the meetings, or selected for publication in the minutes of proceedings, were presented. The thanks of the meeting were unanimously accorded to the president and officers. The ballot for council for the ensuing year resulted in the election of George Robert Stephenson, president; James Abernethy, Sir William George Armstrong, C.B., William Henry Barlow, and John Frederic Bateman, vice-presidents; Sir Joseph William Bazalgette, C.B., I. Lowthian Bell, M.P., George Berkley, Frederick Joseph Bramwell, George Barclay Bruce, James Brunlees, Sir John Coode, Harrison Hayter, William Pole, C. William Siemens, Sir Joseph Whitworth, and Edward Woods, members of council; and Thomas Brassey, M.P., Douglas Galton, C.B., and Joseph Whitwell Pease, M.P., associates of council.

SOCIETY OF ENGINEERS.—The annual dinner of the members of this society was held at the City Terminus Hotel, Cannon Street, London, on Tuesday evening last—Mr. J. H. Adams, the president, in the chair. After the usual loyal toasts had been duly honoured, the chairman gave—"The Army, Navy, and Reserve Forces," which was responded to by Major Baldwin Latham, past president and trustee. The toast of the evening,—"Success to the Society of Engineers," was then proposed by the chairman, who said the Society was established in 1854, for the advancement of engineering science and practice. In proposing the toast he had great pleasure in coupling with it the name of Mr. Alfred Williams, the honorary secretary, treasurer, and trustee, a gentleman who had always shown a warm interest in the welfare of the society, and who had energetically supported it for many years. The toast was enthusiastically received, and Mr. Williams appropriately responded. "The health of the President for the past year and the Chairman," was proposed by Mr. R. P. Spice, one of the vice-presidents, who remarked that Mr. Adams deserved to be well received in a meeting of engineers, he having had to do with the inauguration of the North London Railway, which was carried out under his supervision. And that was not his only claim to honourable mention, for Mr. Adams appeared before them as the most eminent coal-heaver in the Port of London. Perhaps he might not have been aware himself that he was entitled to that poetic designation, but, seeing that he was the inventor of the Derrick steam coal-lifting apparatus, by which millions of tons of coal were annually lifted out of ships in the river, to the abolishment of severe manual labour and the reduction of the cost of coal, he had certainly earned the appellation, while the ingenuity displayed in the machinery referred to would always redound to his credit. The chairman responded, and proposed—"The President Elect for 1876," which was responded to by Mr. V. Pendred. The remaining toasts included "The Vice-Presidents and Members of Council for 1875," proposed by Mr. Jabez Church, responded to by Mr. Cargill; "The Auditor and Secretary," proposed by Mr. C. Horsley, a vice-president, and responded to by Mr. Bennett and Mr. Perry F. Nursey; "The Visitors," proposed by Mr. Bayley, and responded to by Mr. Glaisher; "The Press," proposed by Mr. F. W. Hartley, a vice-president, and responded to by Mr. S. Griffiths; and "The Ladies," proposed by Mr. Rigg, and responded to by Mr. Andrews. During the evening a selection of vocal music was performed under the direction of Mr. King Hall, assisted by Mr. Hodges, Mr. Fairweather, Mr. Hamer, and Mr. Edwards. Mr. James Jacks efficiently discharged the duties of toastmaster.

THE VENTILATION OF DRAINS AND SEWERS AND THE CLEANSING OF HOUSE CISTERNS.—A paper with the above title was communicated to the Royal Scottish Society of Arts, at their meeting on the 13th inst., by Dr. Stevenson Macadam. The water carriage system of disposing of sewage was, he said, a pernicious system. It poisoned our streams and the air above them, and promoted disease in our households. While he was, therefore, no friend to that system, he was not prepared to go back to old methods, nor adopt any of the new systems proposed in its place. He wished to direct attention to a mode by which the evils attending the present system could be to some extent lessened or modified. As a preventive of the evils resulting from the return of gases from the main sewer, he suggested that besides the syphon trap at the water-closets there should be a U-shaped trap between the main sewer and the house, from which trap a fire-clay pipe should lead to the air, with a charcoal absorbent cage at the top. Town drains should be ventilated, and the air passed, if possible, through furnaces in constant operation, or through shafts filled with charcoal. He dwelt on the necessity of periodically cleansing cisterns with a soft brush. Mr. E. Sang (secretary) then opened the discussion on the general subject of sanitary arrangements. He pointed out that the present system of carrying away sewage had infiltrated the whole subsoil of the City with offensive matter, while it wasted good wholesome water at great expense. Good manure was also being by the water system carried away in the most reckless manner to the sea. He was therefore in favour of Captain Liernur's system, which could collect and utilize the sewage without mixing it with water. Mr. William Marshall approved of the Liernur system if it could be shown to work safely. Dr. Alexander Wood said that the present system of drainage ran counter at every point to nature, and the palliatives offered by Dr. Macadam and others were pitiable when the evils of the system were regarded. He pointed to the advantages of the immediate removal of effete matter in a solid state, and this he said could be effected by the Liernur system, which was supported as perfectly safe and feasible by men of the first character in sanitary science. Councillor Durham thoroughly approved of the principle of the Liernur system, if it could be carried out practically. He had calculated that by the adoption in Edinburgh of that system the mortality of the city would be reduced 800 a year from diphtheria, typhoid, &c., and a further saving would be effected of 6d. per pound in taxation. He suggested that the City should send a deputation of practical men to the Continent to make a thorough inquiry into the Liernur system where adopted. Baillie Rowatt thought that Dr. Macadam's idea for disposing of the sewage gases was perfect, if they could only get the gases to come through the charcoal receivers. He was, however, agreeable that the Liernur system should be tried on a new block of buildings in Edinburgh. A number of gentlemen expressed their approval of the Liernur system, and others of the present water-closet system as improved. Mr. Scott, who had read a paper at the previous meeting, having replied to the strictures on the Liernur system, the discussion was adjourned.

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

4296.—BRESSON, A., Forest Hill, London, "An improved process for producing benzine, light oil, and anthracene from hydrocarbures." Dec. 11, 1875.

4298.—WEYHE, W., Bremen, Germany, "Improvements in motor engines worked by steam, air, gas, or other fluid; also partly applicable as pumps or blowing engines." Dec. 11, 1875.

4303.—BLEWITT, R. J., Upper Norwood, Surrey, "An improved method of obtaining the carburetted hydrogen and olefiant gases arising from the distillation of coal." Dec. 11, 1875.

4314.—ANDERSON, J., Glasgow, "Improvements in stop-cocks or valves." Dec. 13, 1875.

4317.—CORT, J., Southwark, London, "Improvements in valves." Dec. 13, 1875.

4320.—MILBURN, R., London, and JACKSON, H., Leeds, "Improvements in the method of and in means for decomposing or rendering less noxious the vapours resulting from processes of drying sewage deposit and other matters." Dec. 13, 1875.

4324.—PREISWERK, L., Wilhelmshaven, Germany, "Improvements in propelling vessels, partly applicable for obtaining motive power, for raising water, and for exhausting and compressing air and gases for other purposes." Dec. 13, 1875.

4341.—MORGAN-BROWN, W., Southampton Buildings, London, "An improved filtering reservoir." A communication. Dec. 15, 1875.

4342.—ALEXANDER, E. P., Southampton Buildings, London, "Improvements in gas motive-power engines and in the means for regulating and transmitting their motion." A communication. Dec. 15, 1875.

4362.—COLLS, F. W., Erith, Kent, "Improvements in the manufacture of gas for heating and lighting, and in the apparatus to be employed therein." Dec. 16, 1875.

4373.—BOLTON, F., Weaste, Lancs, "Improvements in apparatus for weighing and for measuring liquids." Dec. 17, 1875.

4378.—PARKER, R., Bow, London, "Improvements in ventilating and purifying sewers and in apparatus to be employed for those purposes." Dec. 17, 1875.

4401.—STEEL, J., Glasgow, "Improvements in charging and drawing retorts and in the machinery or apparatus employed therefor, also in the means of opening and closing retorts." Dec. 18, 1875.

4409.—COWELL, F. A., Calstock, Cornwall, "Improved non-porous and vitrified blocks, bricks, and other articles for various purposes." Dec. 20, 1875.

4414.—GODFREY, S., and HOWSON, R., Middlesbrough-on-Tees, "Improvements in gas-furnaces." Dec. 20, 1875.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

2312.—CLELAND, W., Linacre, Lancs, "Improvements in jet apparatus for giving motion to fluids." June 24, 1875.

2328.—PEEBLES, D. B., Edinburgh, "Improvements in governors or apparatus for regulating or controlling the pressure and flow of illuminating or other gas." June, 26, 1875.

2358.—ODAMS, J., London, and BLACKBURN, R., Exeter, "Improvements in apparatus for treating sewage." June 29, 1875.

2387.—HOLMES, J. M., Birmingham, "Improvements in gas-stoves for cooking and heating." A communication. June 30, 1875.

2508.—LAKE, W. R., Southampton Buildings, London, "An improved liquid-meter." A communication. July 12, 1875.

2605.—JOHNSON, J. H., Lincoln's Inn Fields, London, "Improvements in blowers or apparatus for compressing or forcing fluids." A communication. July 21, 1875.

2720.—DODGE, J., Manchester, "Improvements in machinery for drilling and boring." July 31, 1875.

3247.—FLEURY, F. G., Bristol, "Improvements in water-meters or apparatus for measuring the flow of liquids or fluids." Sept. 17, 1875.

3396.—MONCKTON, E. H. C., Wansford, Northampton, CREASY, J. T., Lambeth, and TULLY, W., North Bow, London, "Improvements in apparatus or machinery for utilizing the pressure of water, oil, air, gas, steam, or other fluid, as motive power." Sept. 29, 1875.

3398.—WALKER, W. T., Highgate, London, "An improved gas-testing cock." A communication. Sept. 30, 1875.

3539.—LEONARD, W. A., Holborn Viaduct, London, "Improvements in continuous ignition fuses and in the friction match composition employed therewith, which composition is applicable to friction matches generally; also in apparatus or means for propelling and igniting the said fuses, applicable to the lighting of lamps and gas-burners of all kinds, and other purposes of ignition." Oct. 12, 1875.

3542.—Newton, H. R., Seymour Street, London, "A locking apparatus for regulating a constant measured small or large supply of filtered or unfiltered water, to be delivered into existing cisterns or other reservoirs, or by a new system into closed tanks." Oct. 12, 1875.

3615.—Abel, C. D., Southampton Buildings, London, "Improvements in engines worked by gas and air, and in their application for raising or forcing liquids." A communication. Oct. 18, 1875.

3625.—Clark, A. M., Chancery Lane, London, "Improvements in water-meters." A communication. Oct. 19, 1875.

3668.—Slater, J. W., Tamworth Terrace, London, "Improvements in the treatment of sewage deposits or precipitates, or sewage sludge, in order to obtain therefrom ammonia, illuminating gas, and other useful products." Oct. 21, 1875.

3699.—Maw, E., Liverpool, "Improvements relating to the application of atmospheric air for preventing the waste or loss of heat in processes and apparatus wherein heat is generated or utilized, and for preventing the entrance of heat into apparatus used for refrigerating or similar purposes." Oct. 25, 1875.

3703.—Rawson, C., Victoria Chambers, and Slater, J. W., Tamworth Terrace, London, "Improvements in the treatment or purification of sewage and other matters, and in the treatment or preparation of agents to be used in the said purification." Oct. 25, 1875.

PATENTS WHICH HAVE BECOME VOID
BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

3502.—Howland, T. A., and M'Knight, C. G., "Improvements in the manufacture of gas and in apparatus therefor." Nov. 22, 1872.

3513.—Wright, W., "Improvements in apparatus for preventing the waste of water, applicable to water-closets and other purposes." Nov. 23, 1872.

3534.—Thornelor, G., "An improved dip-pipe, forming part of gas apparatus, for use in making gas." Nov. 25, 1872.

3602.—Kay, A., "Improvements in steam-pumps." Nov. 30, 1872.

3647.—Murdoch, H. H., "Improvements in the joints of pipes or tubes." Dec. 3, 1872.

3670.—Scott, H. Y. D., and T. W., "Improvements in the mode of and apparatus for preparing lime for the treatment of sewage." Dec. 4, 1872.

3693.—Haseltine, G., "Improvements in meters for gas or liquids." Dec. 6, 1872.

3728.—Shedlock, J. F. and J. J., "Improvements in the lighting of towns and districts, and apparatus connected therewith." Dec. 9, 1872.

3735.—Jaynor, A., "Improvements in the construction of automatic telegraphs, to be worked by air, steam, or gas." Dec. 9, 1872.

3744.—Key, W., "Improvements in gas-retort settings." Dec. 10, 1872.

3755.—Scott, H. Y. D., "Improvements in the treatment and utilization of sewage water." Dec. 11, 1872.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION has been AWARDED to

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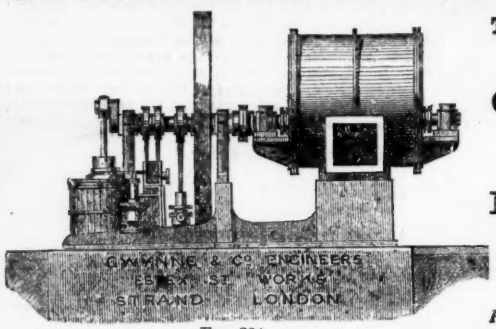

FIG. 224.

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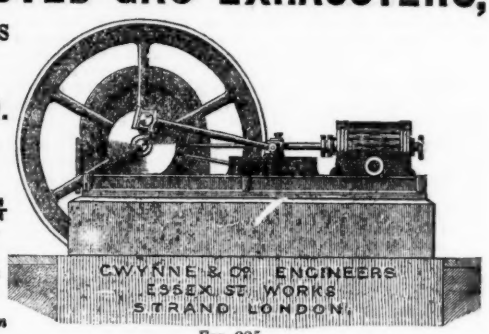

FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. Gwynne and Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES,
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G. & Co. are now manufacturing for a London Gas Company three of their 210,000 *cubic feet Patent Gas Exhausters, and many of all sizes.*

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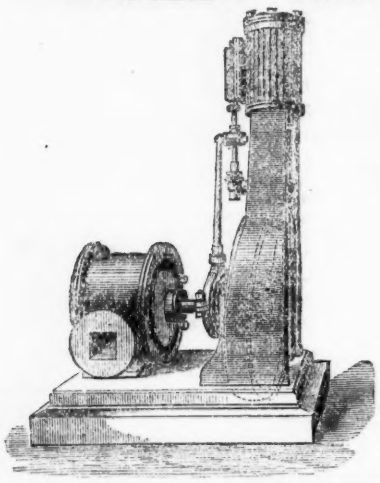

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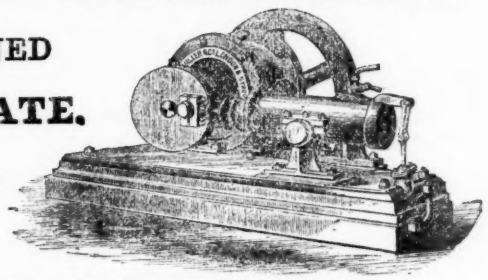
ONE BASE PLATE.
SOLE MAKERS,
GEORGE WALLER & CO.,
Who, since Mr. BEALE'S retirement, are the Oldest Makers.



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TAR, LIQUOR, and SYPHON PUMPS. GAS-VALVES in stock, 2 to 30 inches.
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MANUFACTURERS OF WET AND DRY GAS-METERS;
Patentees and Sole Manufacturers of PEEBLES' LAMP-GOVERNORS,
ABOVE 30,000 OF WHICH ARE NOW IN USE.
"These Lamp-Governors are so superior that they are likely to supplant all others."—*Dr. Wm. Wallace, F.R.S.E., F.C.S.*
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WANTED, as Meter Prover, an experienced Man. Wages 32s. per week.
Address No. 230, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, the Management or Assistant Management of a Gas-Work. Five years practical experience in the manufacture and distribution of gas.
Address No. 214, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CORPORATION GAS-WORKS, ABERAVON, SOUTH WALES.

WANTED, a thoroughly competent FOREMAN or Working Manager for the above works, who understands the manufacture and distribution of gas, retort-setting, and gas-fitting.
Apply, stating salary expected, and with copy of testimonials, to the TOWN-CLERK, Aberavon, SOUTH WALES, on or before Monday, Jan. 24, 1876.

BOROUGH OF LEEDS.

GAS MANAGER.

WANTED, by the Council of this Borough, a MANAGER to reside at and superintend, under the direction of the Gas Engineer, the New Wortley Works, in Leeds. Salary £150 per annum, with house, coals, and gas.
Applications, with testimonials, endorsed "Gas Manager," to be sent to my Office not later than Saturday, the 15th of January next. By order,
CAPEL A. CURWOOD, Town-Clerk.
Leeds, Dec. 16, 1875.

NEW EDITION, NOW READY,

ADVANTAGES OF GAS FOR COOKING AND HEATING.

By MAGNUS OHREN, A.I.C.E., F.C.S.

For Companies to issue to their Gas Consumers.

Specimen Copy by post Threepence, direct from MAGNUS OHREN, Gas-Works Lower Sydenham, London, S.E.

BOROUGH OF WIGAN.

THE Gas Committee of the Wigan Corporation are desirous of obtaining the services of a competent MANAGER of the Gas-Works belonging to the Wigan Corporation. His duties will include everything that pertains to the management and engineering of Gas-Works. Salary £300 per annum.
Applications, stating age, qualifications, and enclosing testimonials, to be sent in to the undersigned on or before Tuesday, the 11th day of January, 1876.
MASKELL WM. PEACE, Town-Clerk.
Town-Clerk's Office, Wigan, Dec. 23, 1875.

WANTED, GAS-WORKS TO LEASE.

THE Engineer of a Work of acknowledged repute is desirous of LEASING a small work. Can offer unusual advantages to companies or proprietors whose undertakings are unremunerative, or have fallen into a dilapidated condition.
Address No. 202, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A Gasholder, 40 ft. by 12 ft., at present in use and in good condition.
Can be seen at Warwick Gas-Works, and any information obtained respecting the same by applying to GEORGE COTTON, Manager to the Company.

STATION-METER for Sale, in good condition (Makers West and Gregson) in very ornamental case, fitted up with tell-tales, inlet, outlet, and bye-pass valves, and 12-in. connexions. Passes 25,000 cubic feet per hour. Now replaced with a larger one.
For price, &c., apply to JOHN W. WHITAKER, Manager, Gas-Works, WAKEFIELD.

GAS-WORKS TO BE LET.

TO BE LET, on Lease, for a term of years, the Lower Gornall Gas-Works, Staffordshire.
The works are situated in a very populous neighbourhood, are fitted up with every requisite, are in full operation, and the make of gas and the number of consumers are steadily increasing.
Possession may be had on the 1st of January next, when the present lessee's term expires.
Apply to Mr. F. KENNING, Secretary, District Gaslight Company, Limited, 21, Darlington Street, WOLVERHAMPTON.

TO CONTRACTORS AND OTHERS.

THE Directors of the Spennymoor and Tudhoe Gas Company, Limited, are prepared to receive TENDERS for the construction upon their premises of a Circular Brick TANK, 82 ft. diameter and 22 ft. deep.
Plans and specifications may be seen, and further particulars obtained, at the Offices of the Company, Spennymoor.
Tenders sealed, and endorsed "Tender for Gasholder-Tank," to be sent in not later than Monday, the 17th day of January, 1876, addressed to R. PRUDHOE, Esq., Secretary, Gas Company, SPENNYMOOR.
The tender lowest in price will not necessarily be accepted on that account.

TO TAR DISTILLERS.

THE Wellingborough Gaslight Company, Limited, are prepared to receive OFFERS for their surplus TAR for the year 1876. Probable quantity about 100 tons.
Particulars on application to the SECRETARY.

TO ENGINEERS AND OTHERS.

THE Directors of the Rochester, Chatham, and Strood Gaslight Company OFFER a premium of £100 for the best design, with all necessary working drawings, for unloading coals from steam colliers and sailing vessels at their works at Rochester.
Lithographic plans, showing site, and particulars of apparatus required, may be had on application to the Secretary, at the Office of the Company, 56, High Street, Rochester.
Plans to be delivered on or before Feb. 29, 1876.
By order,
W. SYMS, Secretary.

TO GASHOLDER MAKERS, IRONFOUNDERS, &c.

THE Gas-Works Committee of the Huddersfield Corporation are prepared to receive TENDERS for a Telescope GASHOLDER, 130 ft. diameter and 52 ft. in length, with the necessary columns and girders complete.
Plans and specifications may be seen by application at the Gas-Works.
Tenders to be addressed to me, and sent in not later than Monday, the 10th of January, 1876, endorsed "Tender for Gasholder."
The Committee do not bind themselves to accept the lowest or any tender.
By order of the Gas-Works Committee,
JOHN BURGESS, Engineer and Manager.
Gas Office, Leeds Road, Huddersfield, Dec. 23, 1875.

MANCHESTER CORPORATION GAS-WORKS.

ADDITIONAL WORKS.

THE Gas Committee of the Corporation invite competitive Plans for intended ADDITIONAL WORKS, to be erected on land situate near Bradford Road, Manchester. The following premiums will be awarded to three plans to be selected—viz., £500, £300, and £200, which plans will become the property of the Corporation.
The Committee do not bind themselves to engage any of the competitors to carry out the works.
The competitive plans must be addressed to the Chairman of the Gas Committee, at the New Town-Hall, Manchester, and be delivered there before Four o'clock in the afternoon of Tuesday, the 21st day of March next.
Lithographed plans of the site, and instructions with regard to the competition, may be obtained from Mr. Thomas Peacock, at the Gas Offices, New Town-Hall, Cooper Street entrance.
On behalf of the Gas Committee,
JOSEPH HERON, Town-Clerk.
New Town-Hall, Dec. 17, 1875.

SOUTHPORT CORPORATION.—MAIN SEWERAGE WORKS.

TO CONTRACTORS.

THE Southport Corporation, acting as the Urban Sanitary Authority, hereby give notice that they are desirous of receiving TENDERS from competent persons willing to enter into a contract for the construction of the Main Outfall SEWER to the Crossens Channel, and several Main Branches, with the necessary screening chamber, side entrances, man-holes, ventilators, penstocks, flushing gates, and other works incidental to the above.
The plans, sections, and drawings may be seen at the Office of Mr. James Mansergh, the Engineer, 3, Westminster Chambers, Victoria Street, London, and at the Town-Hall, Southport, on and after Monday, the 10th day of January next, where also printed specifications and bills of quantities may be obtained on payment of two guineas.
Sealed tenders, endorsed "Main Sewerage Works, Contract No. 1," are to be delivered at my Office, on or before Saturday, the 7th day of February next.
The Corporation do not bind themselves to accept the lowest or any tender.
KEIGHLEY WALTON, Town-Clerk.
Town-Hall, Southport.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.
Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.
Patents procured for Foreign Countries.
Information as to cost, &c, supplied gratuitously upon application to the Advertiser, 22, Great George Street WESTMINSTER.

COST PRICE SHEETS.

MANUFACTURE AND DISTRIBUTION OF GAS. These sheets are the same as were laid before the Dublin Meeting of the British Association of Gas Managers; but in the REPRINT, NOTES have been added for the guidance of those using them. Copies of the two sheets may now be had, price 5s.
South Shields. W. J. WARNER.

Price, by post, 3s. 2d.,

THE CHEMISTRY OF GAS LIGHTING; a Collection of Fragments from Vols. II. and III. of the JOURNAL OF GAS LIGHTING, revised and rearranged, with an Appendix containing a Description of the Different Processes for the Manufacture of Colouring Matters from Coal Tar.

ANALYSES OF THE METROPOLITAN GAS COMPANIES ACCOUNTS; Compiled and Arranged by JOHN FIELD, Accountant to the Imperial Gas Company. Price, 1869-70-71, 21s.; 1872, 10s. 6d.; 1873, 10s. 6d.; 1874, 10s. 6d.
LONDON: WILLIAM B. KING, 11, BOLT COURT, FLEET STREET, E.C.

Now ready, price 7s., by Post 7s. 3d.,
A SECOND EDITION (fcap. 8vo., morocco gilt)
OF
THE GAS MANAGER'S HANDBOOK,
CONSISTING OF
Tables, Rules, and Useful Information for Gas Engineers, Managers,
And others engaged in the Manufacture and Distribution of
COAL GAS.
BY THOMAS NEWBIGGING, A.I.C.E.

WILLIAM B. KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

NOTICE TO THE PUBLIC.
BRONNER'S IMPROVED SYSTEM IN GAS LIGHTING.

MESSRS. HENRY GREENE AND SON, 155, CANNON STREET, LONDON, sole consignees for Great Britain and Ireland of BRONNER'S IMPROVED SYSTEM IN GAS LIGHTING, beg to inform the public that JULIUS BRONNER, of Frankfort-on-Maine, in the Kingdom of Prussia, Manufacturer, has, of this date, 9th of November, 1875, obtained interdict before the Court of Session in Scotland, against R. M. Brechin and Company, Gas-Fitting Manufacturers, 46, Hanover Street, Edinburgh, and R. M. Brechin, the only known partner of the said firm, interdicting, prohibiting, and discharging the said R. M. Brechin and Company and R. M. Brechin from in any way advertising or offering for sale, or selling, or from in any way causing to be advertised, or offered for sale, or causing to be sold as "Brönner's Burners," any burners not manufactured by the said Julius Brönner, or from in any way endeavouring to induce the public to believe that the said R. M. Brechin and Company, or R. M. Brechin, sell or keep for sale "Brönner's Burners" manufactured by the said Julius Brönner, while such is not the case.
Further, the said Julius Brönner, on the 20th of April, 1875, in a suit in Chancery, 1874, B 365, instituted by him against a defendant who had been selling such Burners, obtained an injunction perpetually restraining the defendant, his agents, servants, and workmen, from in any way advertising or offering for sale, or selling, or from in any manner causing to be advertised or offered for sale or sold as "*Real Bronner*," or "Brönner," or "Broehner" Burners, any Burner not manufactured by or for the plaintiff, Julius Brönner, or by his agents.

SZERELMEY Liquid Enamel, for Iron-work exposed to the atmosphere, supersedes paint, dries in two hours, absolutely prevents rust, contains no oil, requires no mixing, is ready for use, is laid on like paint, covers new or old iron or wood, old paint, tar, or whitewash, is waterproof, gives a fine polished surface, and costs scarcely one-fourth as much as paint—namely, one halfpenny per square yard. Samples to any address for 12 stamps. Particulars free on application.

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SZERELMEY Stone Paint thoroughly waterproofs brick and other walls without giving them the appearance of having been painted.

COPIES of Reports on the Szerelmey compositions, by Sir Charles Barry, Sir R. J. Murchison, and Professor Faraday (printed by order of the House of Commons), with other information, may be had on application.

NONE of the Szerelmey compositions contain white or red lead, arsenic, or any other injurious ingredient. When in use and while drying they have a purifying effect on the atmosphere.

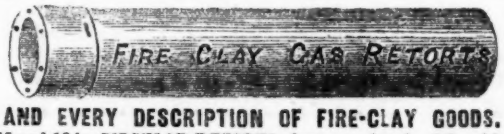
SZERELMEY Liquid Enamel.—The cost of the Enamel when laid on is about one halfpenny per square yard. We are now entering orders for execution at any time before the end of March, at £25 per ton, subject to a liberal discount for cash, particulars of which we will send, if asked. A ton measures about 125 gallons, and is ready for use.

SHIPPERS will receive liberal treat-ment at our hands. They will find that our Enamel Paste can be supplied for shipment at a price with which no ordinary paint can compete.

SZERELMEY Debentures.—Investors desirous of subscribing for the remainder are requested to intimate their intention as early as possible. The debentures will be dated Jan. 1, 1876; from that date interest at 8 per cent. per annum (for which coupons are attached) will be paid quarterly. No prospectus will be advertised, but full particulars will be sent in reply to any application addressed to N. C. SZERELMEY AND COMPANY, Limited, 24, City Bank Chambers, Threadneedle Street, LONDON, E.C.

JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,



AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

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Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.
To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.
To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

D. M. NELSON,
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GLASGOW,
Supplies every requisite in connexion with the distribution of Gas and Water.
Estimates and prices on application.
WOOD GRIDS for Purifiers and Scrubbers.
Cast-Iron PIPES and VALVES.
Street LAMP-PILLARS.
Patent Pipe SCREWING-MACHINES, &c.

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COTTERILL'S PATENT STEEL TUBE-DRILLS, for connecting services to water-mains, *under pressure*, without turning off the water. They drill and tap themselves, and are left in the mains. Made of all sizes, from ¾ to 2 inches and upwards. They cost less than the ordinary plan.
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Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.
Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.
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A LARGE QUANTITY OF RETORTS ALWAYS IN STOCK.

Circular .	14 in.,	15 in.,	16 in.,	18 in.
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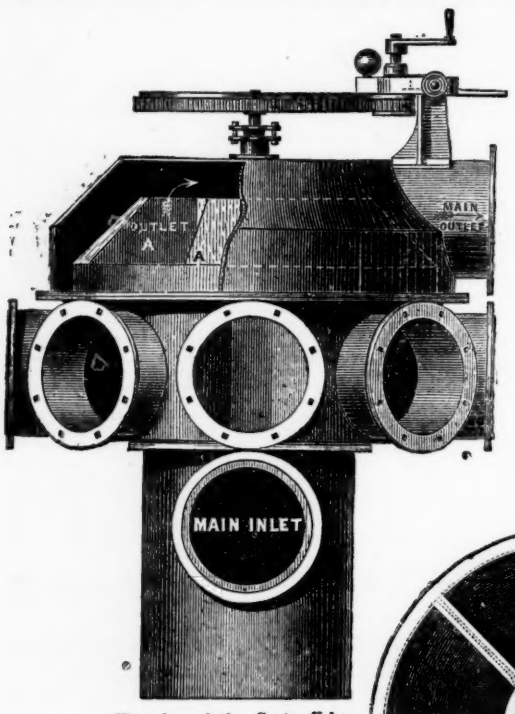
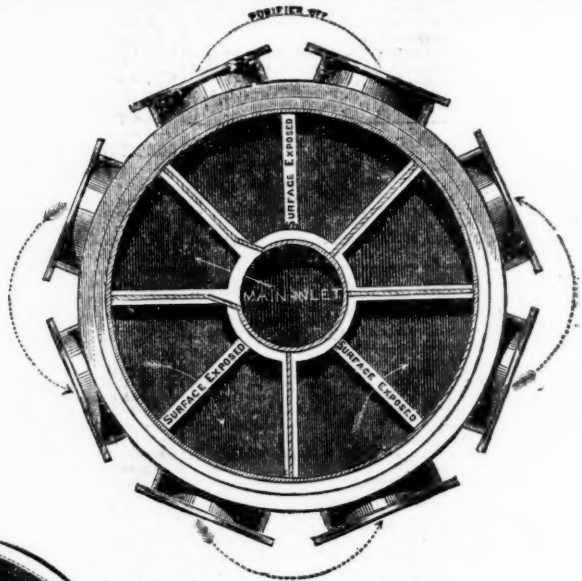
LAP-WELDED IRON BOILER TUBES,
As supplied to the English, French, and Dutch Admiralties, and principal Railways and Engineers at Home and Abroad.

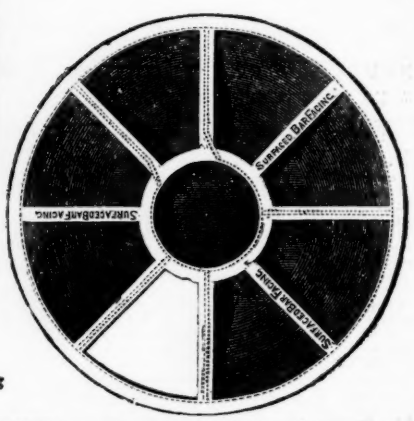
C. & W. WALKERS' PATENT CENTRE-VALVES.



Elevation of the Centre-Valve for four Purifiers. The safety cover is shown broken, to enable the Valve itself, which is inside, to be seen.



Plan of the Body, showing the Valve lying in it, with three of the facings, which were formerly exposed to settlements of dirt, carbon, naphthaline, &c., but which are now always covered by the surfaced bar-facings of the Valve. (See below.)



Plan of the Valve, or upper portion, showing the surfaced bar-facings referred to above.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A very considerable improvement and saving is effected in the cost of the connecting-pipes.

FOUR-WAY CENTRE-VALVES FORMING INLET, OUTLET, AND BYE-PASS.

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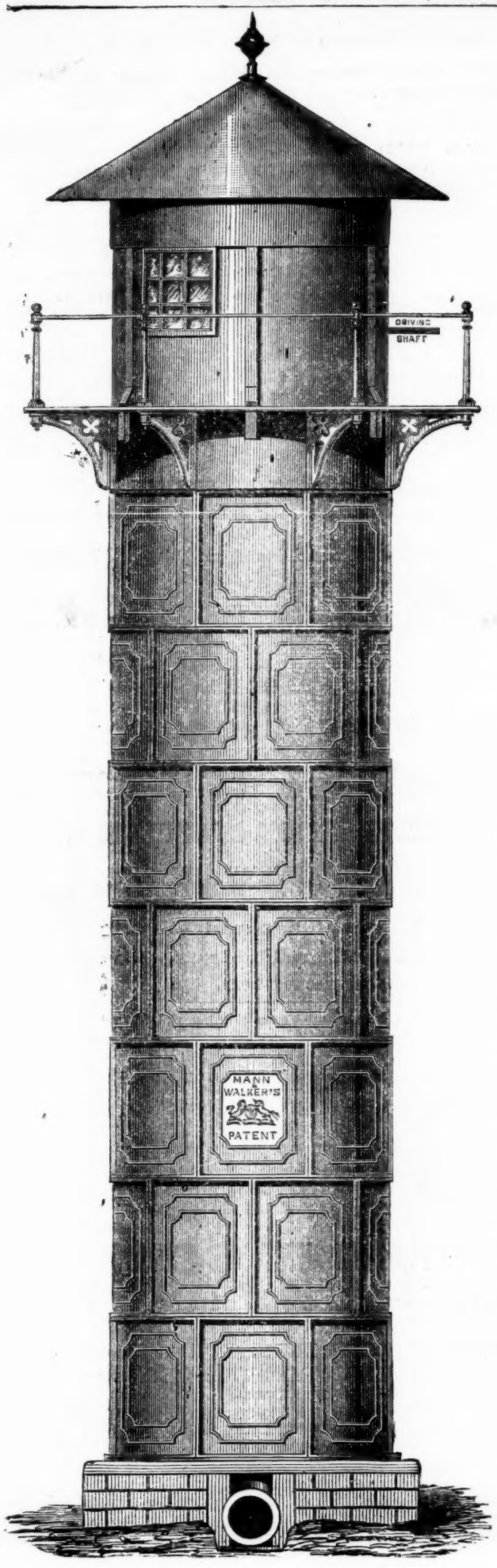

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MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

The improvements made during the past three or four years in all the parts of the internal and external construction and machinery of these Scrubbers have rendered them perfect for their work of purification with all kinds of coal, and their cost is less than any other method of completely purifying gas from ammonia.

They contain their own motive power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

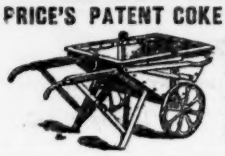
They are, in all cases, constructed under guarantees to perfectly perform their work. They are now extensively used in the largest gas-works of London and the chief cities of Europe, **nearly one hundred being in use,** and their perfect efficiency and profit to a gas company have been fully established with every variety of coal used in Europe. References can be given to the largest gas-works in Europe.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals generally, from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

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Keep in London and at their works large stocks of PIPES and CONNEXIONS (1½ to 36 inches in diameter); also make and supply Retorts, Tanks, Columns, Girders, Special Castings required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

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These Paints have been for many years extensively used in Her Majesty's Royal Dockyards, Woolwich Arsenal, the Shorncliffe and Curragh Camps, War Departments, and Colonies, and are largely supplied to Railway, Harbour, and GAS COMPANIES, Shipowners, Engineering Establishments, Railway Carriage and Waggon Works, and the Paint Trade generally. They are the BEST PROTECTORS of IRONWORK, even arresting corrosion after it has set in; and their base being oxide of iron, they are free from those properties which make lead paints so destructive to ironwork. They do not scale or blister, are not affected by great heat, and are the only Paints which will resist the effects of sulphuretted hydrogen. Their DURABILITY and covering properties have borne the test of A QUARTER OF A CENTURY'S PRACTICAL TRIAL.

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Dart Green.	Slate.
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Brixham Black.	Torbay Chocolate.
Light Blue.	Cream Colour.
Dart Brown.	Dart Umber.
Imperial Stone.	Light Stone.
Bronze Green.	Salmon Colour.
Navy Green.	Lead.
Carriage Red.	Dark Stone.
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All other Colours made to order.

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IRON, BRASS, COMPOSITE, AND LEAD TUBES, FOR GAS AND WATER,

AND EVERY DESCRIPTION OF

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THE PATENT DRY AND WET METER, WITH THE LATEST IMPROVEMENTS.

STREET LAMPS AND COLUMNS IN GREAT VARIETY.

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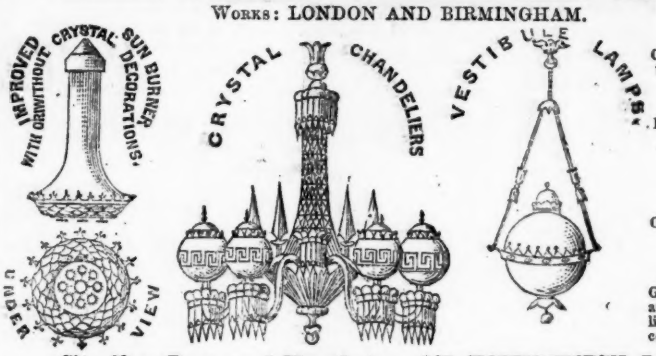

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In Silver and Glass

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Of every description.

Pattern-Books of Gas-Fittings, Crystal and Ormolu Chandeliers for 1875, are now complete.

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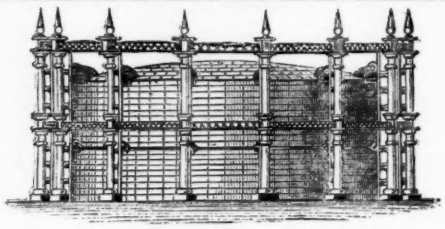

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GAS APPARATUS OF EVERY DESCRIPTION,

Including Improved

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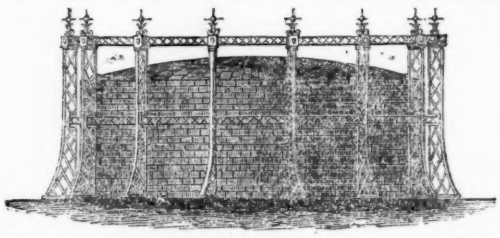
N.B—Estimates for all Gas Plant and Remodelling supplied on application.



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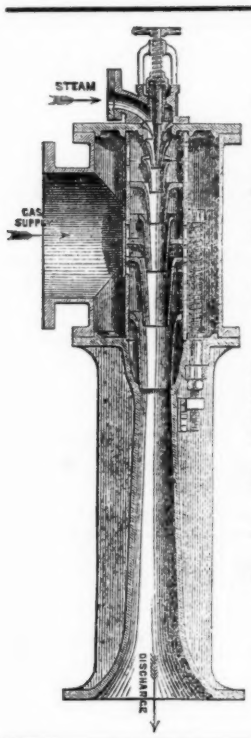
And every description of Gas-Fittings and Gas Apparatus.



KÖRTING BROTHERS,

SOLE LICENSEES FOR

W. CLELAND'S PATENT STEAM-JET GAS-EXHAUSTER.

E. KÖRTING'S PATENT

STEAM-JET GAS-EXHAUSTER.

Small Cost—Compactness—Perfectly Self-Acting—
Self-Regulating—Self-Cleansing—No Steam-Engine—No Attention—
No Extra Room Required—No Wear and Tear—No Noise—
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UPWARDS OF 150 IN USE IN CONTINENTAL GAS-WORKS.

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Combining small cost and thorough efficiency, with absence of any mechanical means and necessity of renewing the scrubbing material.

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It is required, under a PENALTY OF FIVE POUNDS, that a PRINTED COPY of the 4th SECTION of the above Act shall be posted up at all Gas and Water Works in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of the section, in large type, on broad sheets, may be had of WILLIAM B. KING, 11, Bolt Court, Fleet Street, LONDON. Price, per post, 2s. per dozen, or 10s. 6d. per 100.

The Act came into operation on Sept. 1, 1875, and extends to Scotland and Ireland.

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TO COMPANIES PROPOSING EXTENSION OF WORKS AT HOME OR IN THE COLONIES.

J. C. SELLARS respectfully calls the attention of such of his patrons who are Engineers and Managers of Gas-Works, also Architects and Builders, to his system of building with HARDENED SHELL-STONE BLOCKS, as forming, when "filled in," the neatest, strongest, most durable, and economical buildings ever introduced. The Blocks have a hard smooth stone appearance; their size is 18 in. in length, 9 in. in depth, and, as may be desired, 9 in. or 14 in. in width.

To show their cheapness, any clay brick wall costs 8d. per yard on each side for common plastering, that equals 16d.; and these thin Shell-Stone Blocks can now be moulded by a hand-block press as smooth on each side as the best common plaster, for 20d. per yard, and a modification of them for 16d. per yard (the price of the plastering), out of which I allow the ordinary labouring man 6d. per hour for moulding them (8 Blocks), and charge the cement at 50s. per ton, whereas London cement can be bought in cargoes at 32s. per ton, and could be made for less. If, then, you only purchase stones and cementing material (recommended for outside walls), or common mortar and stones, or even burnt clay bricks, laid within the cases and grouting (for inside walls), you obtain walls at a less cost, with the great advantage of the appearance of Ashlar stone buildings, in return for your patronage of the system. But please note the saving where stones are plentiful, or clean hard rock obtainable; and when these fail, if you are on the coast, you have shore sand, which, with hydraulic lime or Portland cement, is suitable for "filling in." In addition, when manufacturing the Blocks, by coating the weather side of the Blocks for the outer wall with a thin film of pure cement, and laying a "damp course" of cement in the foundation Blocks, you can render the wall so absolutely impervious to rain that not one gallon of water would be absorbed in the whole frontage of a house. Brick-setters are the best class of men for laying the Blocks speedily and accurately.

The Advertiser respectfully presents this business as being probably the most paying business of the day to those who have a moderate capital. It should always be remembered that cemented walls of a one-stone character being in most districts much cheaper than the same thickness of clay brick walls, are yet equal in strength and value to walls of bricks and mortar at least half as thick again—namely, 9 in. to 14 in., and as stone dressed on one side and plastered on the other for outside walls, and as plastered on both sides for inside walls. A hand press will turn out at least one super yard of wall (8 Blocks) per hour, and a press with one mould will be lent for a period of six months for the sum of £100, including royalty on the building in any district where I cannot give the address of a licensee. Where river sand is suitable, by taking a press, Portland cement, lime, and a man, Blocks may be made the same day, and afterwards a building be constructed equal in neatness and for health to the best London houses. Where sandstone (red or yellow) exists, that may be crushed for 2s. per ton. To prove the genuine character of the business, I will undertake to pay the train expenses of any Engineer or Manager with whom I may do business in my cement, now or at any previous time, who may favour me with a visit to my office and works, if he says at the time of inspection he is dissatisfied, and that the Blocks are not all that I advertise. I would, with pleasure, by appointment, show him the full series of weather-exposed bricks, Blocks hardened and not hardened, cement-coated, free, &c.; also an unstayed section of a 14-inch wall, one block in width and 14 ft. 6 in. in height, which has been exposed to the gales and frost of this winter, yet without a flaw—a feat of strength of structure that could not be shown with clay bricks and mortar.

The system is admirably suited for country places as well as most towns and the Colonies. Representatives of each of the following papers were at my office:—

Builder's Weekly Reporter, Sept. 24, 1875.—"Nothing can be better than these Blocks. To Builders the great advantages of this invention of Mr. Sellars must be apparent."

Building News, Aug. 20, 1875.—"The advantages to be derived from the system of Mr. Sellars are greater strength of material, compactness, rigidity, sanitary cleanliness, inasmuch as the moulded Blocks present smooth, hard, and stone-coloured surfaces."

Pamphlet on Application.

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All orders direct to J. C. SELLARS, the Gas Cement Works, BIRKENHEAD.

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NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of
CLAY RETORTS, FIRE-BRICKS, AND EVERY DESCRIPTION OF FIRE-CLAY GOODS

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LIMITED,
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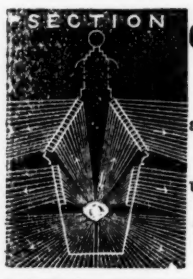

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Is now in use in Moorgate Street, Cheapside, and Trafalgar Square, and has been in successful operation upon Waterloo Bridge since Oct. 7, 1871.
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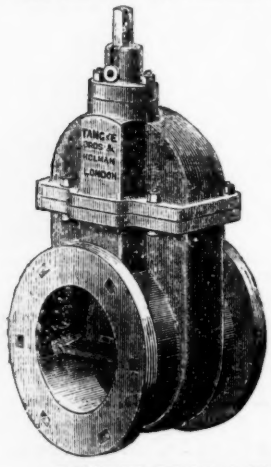

Inch.	s.	d.
3	25	0
4	36	0
5	40	0
6	54	0
7	63	0
8	80	0
9	85	0
10	100	0
12	120	0
14	140	0

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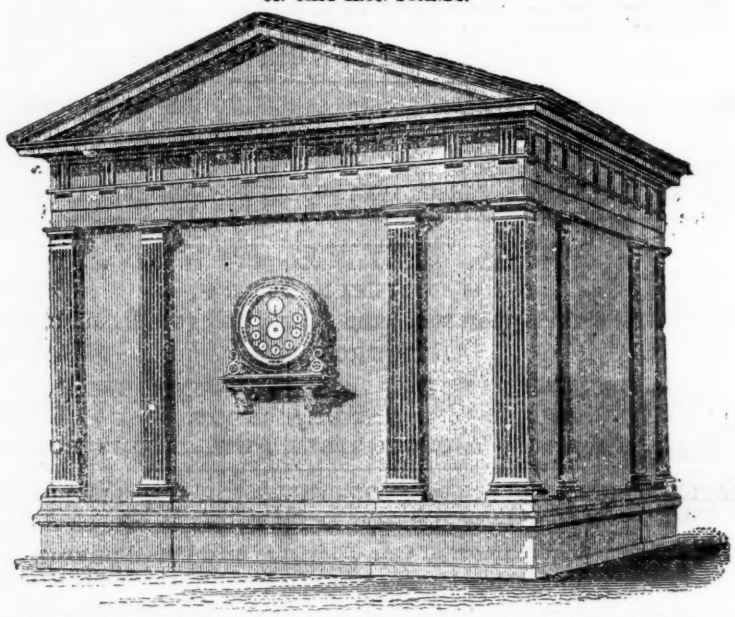

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TABLE GLASS OF ALL KINDS.
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STEAM-ENGINES and EXHAUSTERS, separately or combined.
FOUR-WAY VALVES, one of which is equal to three ordinary Valves.
STATION GOVERNORS—the Gasholder cannot tilt and cause accident.
BREEZE AND TAR FUEL MACHINE.

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"The Author is well qualified to speak authoritatively upon the important subjects to which his pamphlet refers."—*Artizan.*

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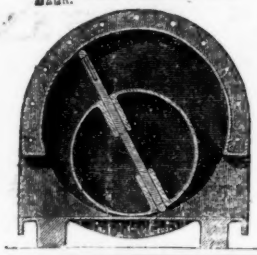

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ARE NOW MANUFACTURED BY

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MR. J. BEALE, of East Greenwich, having retired from business, has made an arrangement with B. DONKIN & CO. for the sole manufacture of his Patent Solid-Slide Gas Exhausters. B. D. & Co. also make Steam-Engines to drive Gas Exhausters direct or otherwise, and Gas-Valves.

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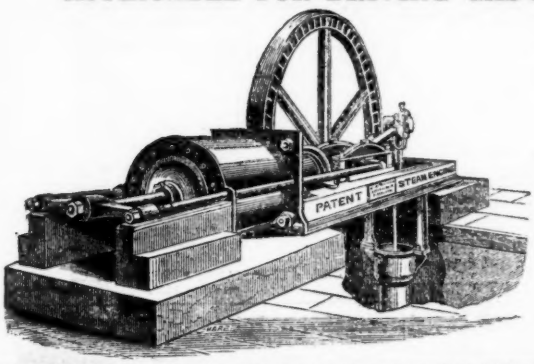
PATENT HORIZONTAL COMPOUND CONDENSING

STEAM-ENGINES,

APPLICABLE FOR DRIVING GAS-EXHAUSTERS.



These Engines have been at work a sufficient number of years to prove their durability and efficiency.

One of them has been subjected to a scientific and exhaustive trial to test the consumption of fuel, with the result that an expenditure of less than **2 lbs.** of coal per hour developed one indicated horse power.

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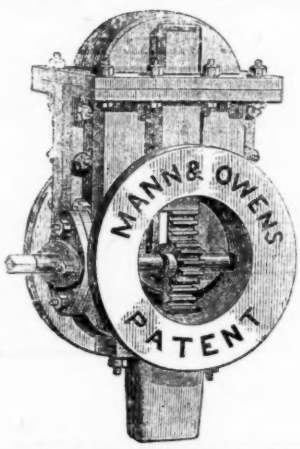
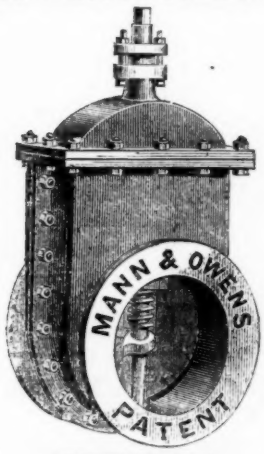


RACK AND PINION VALVE.



SCREW VALVE.

The advantages of this Patent Valve over all others yet introduced are, that it is always as tight as the best wedge or spring valve, without the possibility of setting fast or becoming suddenly leaky. The surfaces not being in contact during the operation of opening or closing, leakage through wear and tear is avoided.

The Gas Engineer will not fail to see the importance of such a valve in connexion with his purifying apparatus, particularly in the case of large sizes.

The slide being operated either by a screw and nut, or by a pinion and rack, a cam bearing upon a plane, cast on the back of the Valve, forces it against the face, and renders the escape of gas an impossibility. By a slight turn of the pinion or screw, the slide is released, and brought away from the face, by which means friction is avoided, and the only force required to open the Valve is that due to its own weight.

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Larger and smaller sizes in course of construction.

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Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

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Yields 13,320 cubic feet of 32·5-candle gas per ton.
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Of the Abram Colliery Company, are worthy the attention of gas producers, showing a good yield of gas and a large residuum of excellent coke. When blended with one-seventh cannel, the gas is of specially high illuminating power.
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Supply and Contract for all the principal Scotch Gas Coal (including BOGHEAD, HARTHILL, CHAPELSIDE, LESMAHAGOW, and BRAEHEAD), f.o.b., or delivered at home or abroad.
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Scotch Churls
PRESENT PRICE:
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Cubic Feet.	Illuminating Power.	Coke (sup. qual.).
10,000 ..	20 candles. ..	12 cwt.

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Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.
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COPPA COLLIERY, MOLD,
Beg leave to call the attention of Gas Companies to the superior quality of their
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This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 35·9-candle gas.
Ports of shipment—Birkenhead or Connah's Quay.
Waggons supplied for delivery by railway to any part of England or Wales.
For particulars, prices, and rates of freight, apply to The Coppa Colliery, Mold, FLINTSHIRE.

THE
FRAMWELLGATE COAL COMPANY,
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Are prepared to supply their
SCREENED AND NUT GAS COALS.
This Coal yields 11,000 cubic feet of gas and 13½ cwts. of coke per ton.
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WILLIAM FRASER,
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RETORTS, FIRE-BRICKS, &c.,
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References can be given to managers of above a hundred Gas-Works whom he supplies.
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CELEBRATED SILKSTONE GAS NUTS.
Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—
(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.
Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.
These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.
APPLICATIONS FOR PRICES, &c., TO BE SENT DIRECT TO THE COLLIERY, AS ABOVE.

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Mr. EDMUND TAYLOR, Secretary,

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1. The following are the practical results given by Dr. Wallace, of Glasgow, of analyses of their Lochore and Capledrae Cannels:—

	Sample worked at Capledrae.	Sample worked at Lochore
Gas per ton of coal, at 60° Fahr. and 30 inches barometric pressure . .	13,095 cubic feet.	11,760 cubic feet.
Illuminating power, in standard sperm candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	32·91	34·83
Value of 1 cubic foot of gas in grains of sperm	780	836
Equivalent of a ton of coal in pounds of sperm candles	1,459	1,404
Durability of 1 cubic foot by 5-inch flame	69 minutes.	71 minutes.
Gravity of the gas (air = 1000)	596	594

Remarks.—This (the sample from Capledrae) is a Cannel Coal of first-class quality, giving 13,000 feet of 33-candle gas. It contains only a minute proportion of sulphur, and the ash is almost quite white. The coke is of rather inferior quality.

Remarks on Sample from Lochore.—This is a Cannel Coal of first-class quality, giving a large yield of very rich gas and a coke of medium quality.

2. The following are the practical results of analyses by Dr. Wallace of the Company's Waverley Cannels:—

	Capledrae Waverley.	Lochore Waverley.
Gas per ton of coal, at 60° Fahr. and 30 inches barometer	9,120 cubic feet.	11,145 cubic feet.
Illuminating power, in standard candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	36·62	33·09
Value of 1 cubic foot of gas in grains of sperm	878	794
Equivalent of a ton of coal in pounds of sperm candles	1,145	1,264
Durability of 1 cubic foot of gas by 5-inch flame	80 minutes.	67 minutes.
Gravity of the gas (air = 1000)	677	597

Remarks on the Sample of Capledrae Waverley.—This Coal gives fully 9000 feet of gas of 36½ candles, and is admirably adapted for bringing up the quality of gas made from common coal or inferior qualities of cannel. The tests were made at a rather high temperature, this being one of the coals that stand a very high heat without serious diminution of the illuminating power of the gas The coke contains 60 per cent. of ash, and is therefore almost valueless, but the proportion of sulphur is very moderate.

Remarks on the Lochore Waverley.—This is a first-class Cannel Coal, giving 11,000 cubic feet of 33-candle gas. The quantity of sulphur is very minute, and the ash is nearly white. The coke is of inferior quality, but not wholly valueless.

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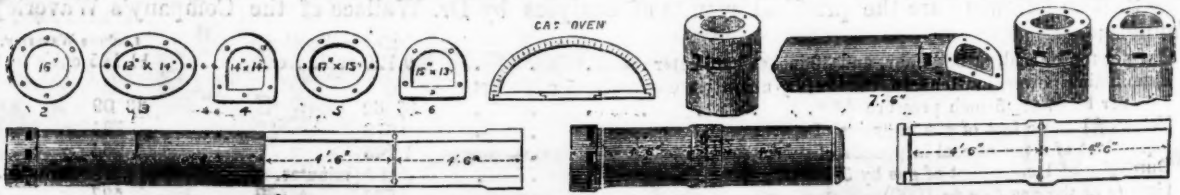

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